INTRACOM

NETWORK TERMINATION UNIT

netMod

USER'S MANUAL

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Terms and Abbreviations

2B1Q	2 Binary 1 Quaternary Line Code
AMI	Alternate Mark Inversion
BAP	Bandwidth Allocation Protocol
BACP	Bandwidth Allocation Control Protocol
BOD	Bandwidth on Demand
BRA	Basic Rate Access
DTE	Data Terminal Equipment
DCE	Data Communications Equipment
HDLC	High Speed Data Link Control
ISDN	Integrated Services Digital Network
kbps	Kilobits per second
Mbps	Megabits per second
MLPPP	Multilink PPP
NPM	Normal Power Mode
NT	Network Termination
POTS	Plain Old Telephony Service
PPP	Point-to-Point Protocol
PRA	Primary Rate Access
RPM	Restricted Power Mode

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1. INTRODUCTION

ISDN stands for **Integrated Services Digital Network**. This is an ITU-T term formulated to describe basically the existing telephone network, i.e. the Plain Old Telephone System (POTS), turned all digital end-to-end. ISDN is capable of providing the end user with high speed data and voice communication services at the same time. Network access is provided using one of the two available communication protocols. The first is called **Basic Rate Access** (BRA) and uses two 64kbps data channels (B-channels) and one 16kbps data channel (D-channel). The second is called **Primary Rate Access** (PRA) and uses thirty 64kbps B-channels for data, and one 64kbps D-channel for signalling.

The physical interface of the Basic Rate Access is a simple two-wire line over which the communication is digital, full duplex and at a 160kbps rate. This rate is made up of the two B-channels, the D-channel as well as a 4kbps maintenance channel (M-channel) and a 12kbps synchronisation channel. A typical ISDN Basic Rate Access connection is shown at Fig. 1.

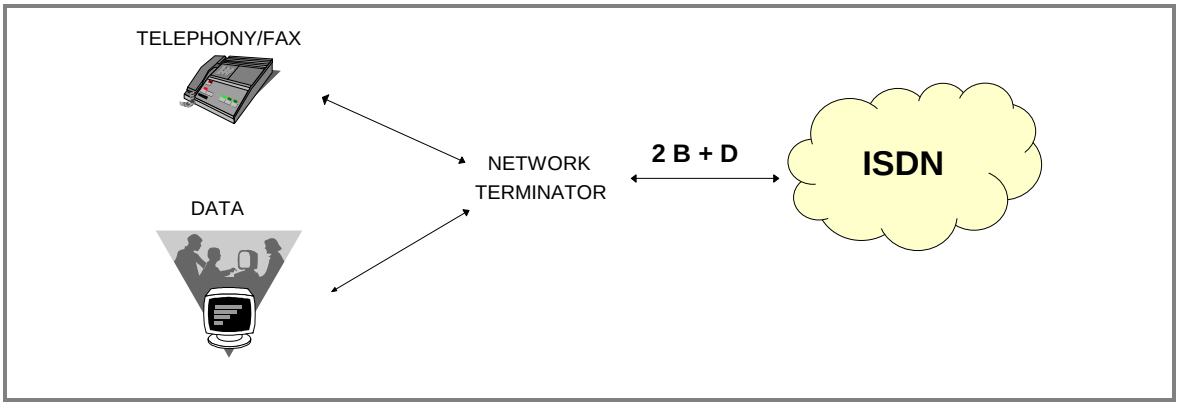


Fig. 1: The basic access connection (BRA) between user and ISDN network

For the connection to an ISDN digital exchange a special device is required at the end user side to provide connection points for ISDN devices (Terminal Equipment) when using the BRA interface. This device is known as **Network Termination Unit** (NT1).

2. PRODUCT DESCRIPTION

2.1. GENERAL

Despite the emergence of much advertised new technologies offering high speed Internet access, such as cable modems and Asymmetric Digital Subscriber Line (ADSL), ISDN remains the most widely available Internet connection. Intracom's netMod is a NT type product targeted at the growing Internet and telecommuting applications market. It enables users of Personal Computers (PC) to connect to the Internet and at the same time allows them to connect to the analogue world via their existing analogue equipment.

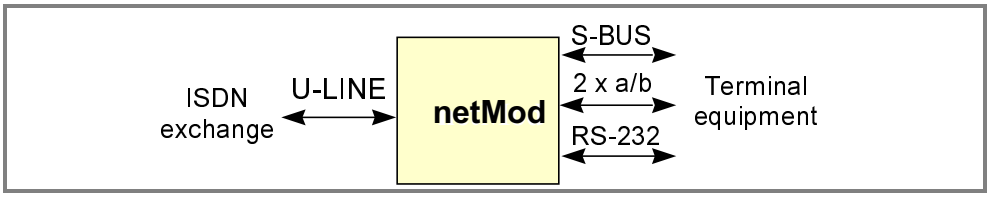


Fig. 2: The netMod

It is connected to the ISDN digital Exchange through a simple two-wire line called U-interface or simply U-line. The 160 kbps full duplex digital transmission over the U-line uses the 2B1Q transmission code (2 Binary 1 Quaternary) typical for BRA connections.

ISDN Terminal Equipment is connected to netMod via a four-wire ISDN bus known as the S-bus. Up to eight ISDN terminal devices can be connected to the S-bus. Communication between netMod and ISDN terminal devices through this bus is digital, full-duplex at a rate of 192kbps and AMI transmission code is used. The total rate of 192 kbps is made up of the two 64kbps B-channels for data/voice transfers, the 16kbps D-channel used mainly for signalling and a 48kbps synchronisation channel.

Two analogue ports allow the connection of POTS- type terminal devices while a PC may be connected via the asynchronous serial port (RS-232). The protocol used for signalling between the POTS devices and the ISDN exchanges is the Euro-ISDN described in the standards ETS 300 102 and ETS 300 125.

2.2. KEY FEATURES

2.2.1. PHYSICAL CHARACTERISTICS

- RJ-45 for S interface (two)
- RJ-11 for analogue device connection (two)
- RJ-11 or terminal block for U interface
- DB-9 connector for DTE
- USB type B receptacle connector (OPTIONAL)

2.2.2. CAPABILITIES

- RS-232 Interface (with speed up to 230.4 kbps) for Internet access
- USB Interface (with speed up to 12 Mbps) for Internet access (OPTIONAL)
- Interoperability with any operating system (Linux, Windows 95 etc.) by using non-proprietary protocols
- PPP (Point to Point Protocol) synchronous-to-asynchronous conversion for 64 kbps communication
- B-channels bundling with Multilink-PPP support of up to 128 kbps
- Bandwidth allocation protocols BACP/BAP
- Transparent operation between B channels and RS232 port
- AT commands
- Full ISDN service support for the POTS interfaces, provided that the user is subscribed to the relevant ISDN services:
    - *Call waiting (CW):* The user while engaged in a call, is notified of an incoming call and has the options to accept it, reject it or ignore it
    - *Calling Line Identification Presentation (CLIP):* allows the user to receive and display the telephone numbers of incoming calls before answering, provided that the caller has not restricted the sending of his/her identity (*CLIR - Calling Line Identification Restriction* supplementary service) and that his/her telephone set is physically capable of displaying information to the user

- *Advice of Charge (AOC):* the caller is informed about the charging conditions during the call

- *Call Forwarding Unconditional (CFU):* all incoming calls are diverted to another national number destination pre-selected by the user

- *Call Forwarding on Busy (CFB) :* when both B-channels are busy all incoming calls are diverted to another national number destination pre-selected by the user

- *Call Forwarding on No Reply (CFNR) :* In case of no answer in an incoming call, the call is diverted to another pre-selected national number destination

- *Multiple Subscriber Number (MSN):* up to 8 pieces of terminal equipment can be connected to an ISDN line with up to two making calls at any one time. This service allows the user to program telephone numbers in to each device on the line (POTS and DTE) so that only the called device will ring

- *Terminal Portability:* a user, engaged in a call, may suspend the call and resume it from the same or different terminal on the same or different POTS or ISDN interface

- *Three Party Conference:* this service allows a user to add a new party to an existing call

- *Malicious Call Identification (MCI):* this service allows a user to request that the source of an incoming call is identified and registered by the network

2.2.3. INTELLIGENT FEATURES

- Bandwidth on demand
- Incoming voice call detection during a data session
- Flash memory for easy and convenient firmware upgrades
- optional: Remote management and firmware download possibility via a Network Management System at the PTT premises
- power saving: when the exchange releases a call while the handset is still off-hook, the relevant subscriber circuit is turned to power down state with zero power consumption. The subscriber line is scanned every 1 second until the subscriber places the handset to its on-hook position.

2.3. INTERNAL STRUCTURE

The block diagram in Fig. 3 presents netMod's internal structure.

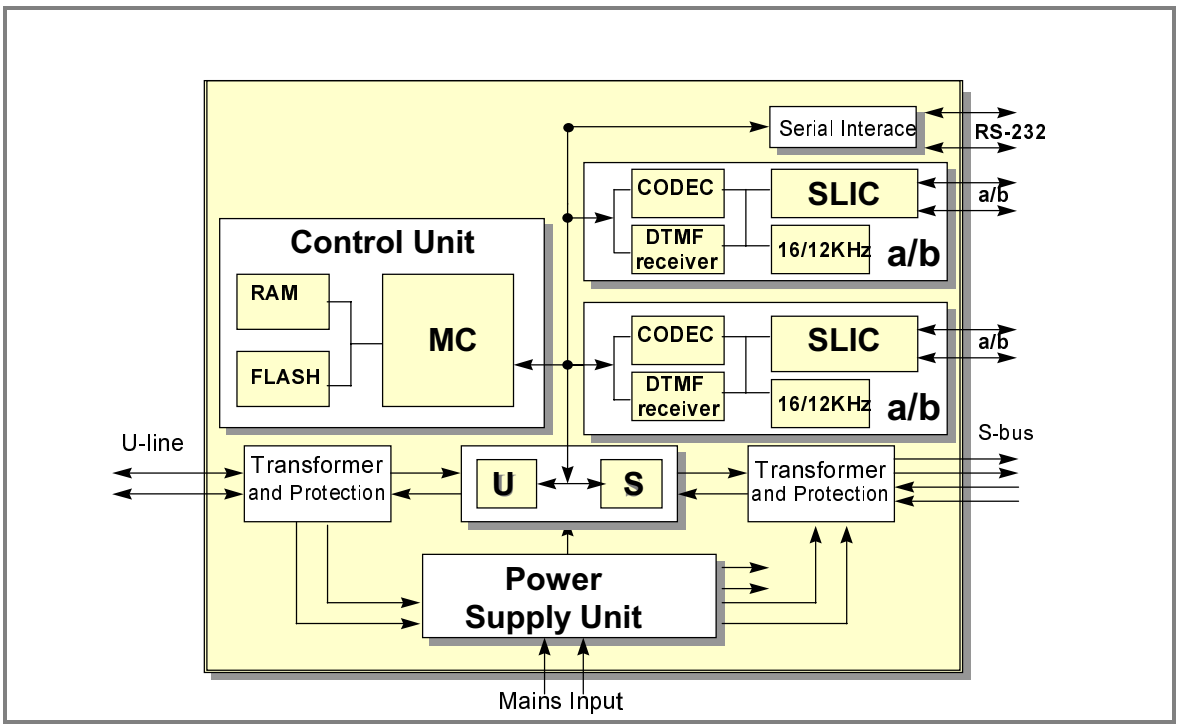


Fig. 3: netMod's structure

The functional units shown are described below:

- The ISDN exchange interfacing unit, using a twisted-pair line (U-line).
- The ISDN terminal devices interfacing unit, using a four-wire line (S-bus).
- Two identical interfacing units for analogue devices (a/b interfaces). These units consist of the subscriber loop control and ringing section, the A/D and D/A A-law voice conversion part (codec), the DTMF decoder part (DTMF receiver), and the charging parts for the 16 kHz charging pulses.
- The Control Unit, consisting of a microcontroller (μC), which is responsible for the correct operation of netMod and the generation of the locally produced tones, and the RAM and FLASH memories.

- The Personal Computer communication unit (Serial Interface) for connection to the Internet or other compatible modems, using the PPP and Multilink-PPP protocols, through an asynchronous serial port RS-232.

  PPP is used for packet transmission in serial point to point links. One of the features of this protocol is that it may contain packets of other protocols, including the TCP/IP (Transmission Control Protocol/ Internet Protocol), which is used in the Internet. Multilink-PPP provides a mechanism for breaking up the PPP packets into more than one serial channels, in order to increase the total size of data. netMod is capable of connecting to the Internet either through a single 64kbps serial B-channel using PPP, or through both B-channels (total 128kbps) using Multilink- PPP. If Multilink-PPP is active and a voice call needs to be answered or placed, netMod automatically drops one of the two B-channels and uses it for this call. Once the voice call ends, netMod re-establishes the channel (Dynamic Bandwidth Allocation).

- The Power Supply Unit, supplying the 5V operating voltage for netMod, the operating voltage for ISDN subscriber terminals (40V), as well as the operating voltages for POTS- type terminal devices. The subscriber's ISDN Terminal Equipment as well as the analogue devices are remotely powered by netMod, using the Mains Power Supply. In case of Mains Power Failure (RPM), netMod is able to provide operation voltage to either an ISDN Terminal or to a POTS device using the U-line's power.

The connection of netMod to the ISDN exchange and the subscriber terminals (ISDN, POTS, PC) is shown in Fig. 4.

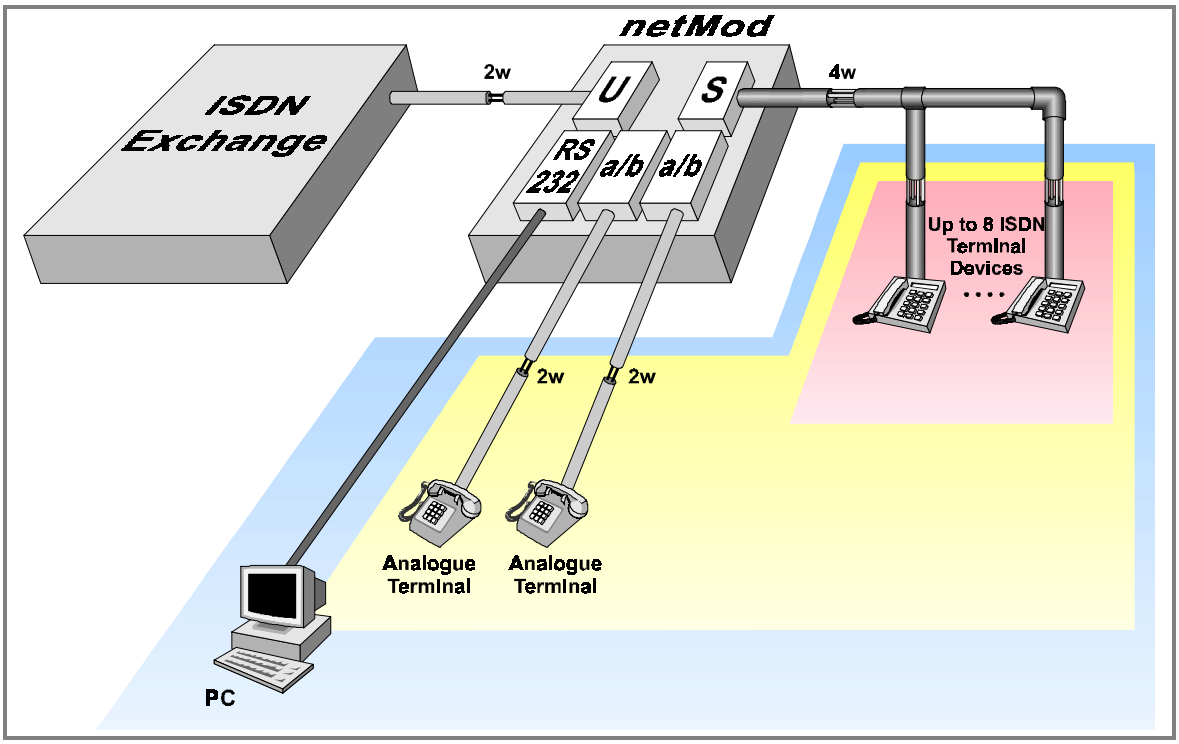


Fig. 4: netMod's connection with the subscriber's terminals (POTS, ISDN and PC) and the ISDN exchange

3. SUPPLEMENTARY SERVICES

Supplementary services can be activated /deactivated separately in each analogue port, by means of an analogue telephone set with tone (DTMF) dialling connected to the corresponding netMod's analogue port. This can be also achieved via the AT commands from the serial port to the PC.

netMod does not activate / deactivate the supplementary services for the S-Interface port. Signalling and data that concern this port, are transferred transparently through netMod. The subscriber, following the users instructions of the terminal equipment connected to the S-Interface port, can activate / deactivate the supplementary services for each equipment.

The operator of the ISDN exchange has to participate for the proper functionality of supplementary services. The operator defines, after a subscriber's demand, which of the supplementary services can be supplied. The subscriber then, can activate / deactivate these services in each analogue port, depending on his needs.

The following services are available in each analogue port.

3.1. CALL WAITING (CW)

When this service is activated in an analogue port, the user during his current call receives an indication tone informing for an incoming call.

The incoming call is placed in a waiting state for a particular time and the user can answer this waiting call by pressing:

- Flash key and 2 to accept the waiting call and place the current call on hold (the same key combination is used to switch between the two calls).
- Flash key and 1 to accept the waiting call and release the current call.
- Flash key and 0 to reject the waiting call.

If the user ignores the call waiting indication, the waiting call is rejected after a particular time duration.

The call waiting can be activated for each analogue port by dialling :

*43#

The call waiting can be deactivated for each analogue port by dialling :

#43#

Using AT commands write in S79 Register the proper values to activate / deactivate the supplementary services in each analogue port (POTS1 or POTS2).

ATS79=0 deactivates the service in each analogue port POTS1 and POTS2

ATS79=4 activates the service in the analogue port POTS1 and deactivates the service in the analogue port POTS2

ATS79=8 deactivates the service in the analogue port POTS1 and activates the service in the analogue port POTS2

ATS79=12 activates the service in each analogue port POTS1 and POTS2

It must be considered that this service is initially activated in both analogue ports of netMod. The activation / deactivation of this service using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

3.2. CALL HOLD AND ENQUIRY CALL (CH)

The user can have an active call on line and make a second call from the same POTS port.

The key combinations listed bellow can be followed:

- Flash key to place the current call on hold and wait for dial tone.
- After the dial tone, the enquiry call can take place, dialling the called user's number and wait for an answer.

Then it can be pressed:

- Flash key and 2 to switch between the two calls

  or

- Flash key and 1 to release the current call and retrieve the call on hold

3.3. THREE PARTY CONFERENCE (3PTY)

When the user has an active call on line and a second call on hold then by pressing :

- Flash key and 3 establishes a three party conference for the active call and the held call

If the user has establish a three party conference then by pressing :

- Flash key and 2 splits up the three way conference. There is again an active call on line and a second call on hold.

3.4. CALLING LINE IDENTIFICATION PRESENTATION (CLIP)

Calling line identification presentation is a service offered to the called user and presents the calling party's number. In the telephone set of the called user, appears the number of the calling subscriber. This service is implemented by means of FSK signalling in netMod's analogue ports. The called user has to posses the proper terminal equipment that transforms the FSK signalling to a visual indication.

It must be considered that if the service CLIP is available for supply to the subscriber, netMod initially does not allows the presentation of the calling subscriber's number through FSK signalling, to the called user's terminal equipment connected to the analogue ports POTS1 and POTS2.

Allow the transmission of the CLIP signal for each analogue port by pressing:

*85#

Restrict the transmission of the CLIP signal for each analogue port by pressing:

#85#

Using AT commands the called user can write on the S84 Register the proper value to allow / restrict the forwarding of the calling user's number to both analogue netMod's ports.

ATS84=0 allows the forwarding of the calling subscriber's number to the called subscriber's terminal equipment connected to the analogue ports POTS1 and POTS2.

ATS84=16 restricts the forwarding of the calling subscriber's number to the called subscriber's terminal equipment connected to the analogue ports POTS1 and POTS2. The activation / deactivation of this service using the keypad

commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

The calling subscriber can define which of his multiple subscriber numbers (MSN) defined in each analogue port will appear in the called subscriber, when he calls him from the specified port, by pressing:

**90* MSN number #

The above procedure can also be implemented using AT Commands as described below:

at&zoa= MSN number, for the analogue port POTS 1

at&zob= MSN number, for the analogue port POTS 2

at&zoi= MSN number, for the serial data port

The above adjustments are stored permanently in netMod's memory. If the calling subscriber does not make the above definitions for a port, when he calls from that port it will appear on the called subscriber his basic subscriber number, that is defined for his BRA access in the local ISDN exchange.

3.5. CALLING LINE IDENTIFICATION RESTRICTION (CLIR)

Calling number identification restriction is a service offered to the calling user to prevent presentation of the calling party's number. The following key combinations are valid only when the user is subscriber in CLIR service in a call by call basis.

- Restrict presentation of calling party's number when pressing:

*31#

- Allow presentation of calling party's number when pressing:

#31#

ATS85=0 deactivates the service in each analogue port POTS1 and POTS2

ATS85=1 activates the service in the analogue port POTS1 and deactivates the service in the analogue port POTS2

ATS85=2 deactivates the service in the analogue port POTS1 and activates the service in the analogue port POTS2

ATS85=3 activates the service in each analogue port POTS1 and POTS2

It must be considered that this service is initially deactivated in both analogue ports of netMod. The activation / deactivation of this service using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers in is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

- Restrict presentation on a call by call basis when pressing:

31 and then dial the destination number

3.6. CONNECTED LINE RESTRICTION (COLR)

Connected Line Restriction is a service offered to the called user to prevent presentation of the called party number during the connection of the call.

- Restrict presentation of called party number (COLR activation) when pressing:

*77#

- Allow presentation of called party number (COLR deactivation) when pressing:

#77#

ATS85=0 deactivates the service in each analogue port POTS1 and POTS2

ATS85=4 activates the service in the analogue port POTS1 and deactivates the service in the analogue port POTS2

ATS85=8 deactivates the service in the analogue port POTS1 and activates the service in the analogue port POTS2

ATS85=12 activates the service in each analogue port POTS1 and POTS2

It must be considered that this service is initially deactivated in both analogue ports of netMod. The activation / deactivation of this service using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

3.7. MALICIOUS CALL IDENTIFICATION (MCID)

Malicious call identification allows the called user to ask from the network the identification of the calling number, when the calling user has activate the CLIR service. The information is given in a printed form, from the local exchange to the called user.

The malicious call trace can be activated during the call when pressing:

- Flash key and *39#

3.8. ADVICE OF CHARGE DURING THE CALL (AOC-D)

The advice of charge service informs the calling subscriber for the charge of his call, during the call.

The advice of charge information is transformed to 16kHz metering pulses at the analogue ports of netMod. The subscriber has to possess the proper equipment in order to convert the metering pulses into optical indication. This equipment is connected with the telephone in series.

- Turn pulse metering on when pressing :

*89#

- Turn pulse metering off when pressing :

#89#

Using AT commands write in S89 Register the proper values to allow / restrict the forwarding of metering pulses in each analogue netMod's port (POTS1 or POTS2).

ATS89=0 deactivates the service in each analogue port POTS1 and POTS2

ATS89=32deactivates the service in the analogue port POTS1 and activates the service in the analogue port POTS2

ATS89=64 activates the service in the analogue port POTS1 and deactivates the service in the analogue port POTS2

ATS89=96 activates the service in each analogue port POTS1 and POTS2

It must be considered that this service is initially deactivated in both analogue ports of netMod. The activation / deactivation of this service using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

3.9. TERMINAL PORTABILITY (TP)

The user can suspend an active call and then resume it within three minutes from the same or another POTS/ISDN terminal.

Suspend an active call by pressing :

- Flash key and *19#

and resume a suspended call by pressing :

- #19#

3.10. DELAYED CLEAR BACK

When a call has been established and the B-party has place the handset on-hook, a time supervision of 90 sec is initiated. If during this time supervision the user places the handset off-hook, the current call will be restored. When this time supervision expires the connection is released.

- To turn delayed clear back on press:

**70#

- To turn delayed clear back off press:

**71#

With the use of AT commands write on the S83 register the proper values to activate / deactivate this service in each analogue port (POTS1 or POTS2).

ATS83=0 activates the service in analogue ports POTS1 and POTS2

ATS83=1 deactivates the service in analogue port POTS1 and activates the service in analogue port POTS2

ATS83=2 activates the service in analogue port POTS1 and deactivates the service in analogue port POTS2

ATS83=3 deactivates the service in analogue ports POTS1 and POTS2

It must be considered that this service is initially activated in both analogue ports of netMod. The activation / deactivation of this service using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation / deactivation of this service using S-Registers is not permanent. In this case to

permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

3.11. MULTIPLE SUBSCRIBER NUMBER (MSN)

The MSN service assigns multiple subscriber numbers to a single BRI line. In each POTS port and serial port, up to three subscriber numbers can be assigned and stored in relative memory locations of netMod.

The following procedures assign or delete (MSN) numbers to the memory for the analogue ports (POTS1 or POTS2) and the serial data port:

- For each analogue port write the desired (MSN) number to memory location X (X= '1' or '2' or '3') by pressing:

**9X* and then the MSN number and #

- For each analogue port delete the (MSN) number that is stored to memory location X (X= '1' or '2' or '3') by pressing:

**9X*#

- Using AT commands, assign or delete (MSN) numbers to the memory for each analogue port (POTS1 or POTS2).

For POTS port 1 type :

at&ziN= MSN number, to assign an MSN number to port POTS 1

The number N takes the values:

N=0, for the first MSN port number

N=1, for the second MSN port number

N=2, for the third MSN port number

at&ziN= Enter key, to delete a previously assigned MSN number to port POTS 1 (N=0 or 1 or 2)

For POTS port 2 type :

at&ziN= MSN number, to assign an MSN number to port POTS 2

The number N takes the values:

N=3, for the first MSN port number

N=4, for the second MSN port number

N=5, for the third MSN port number

at&ziN= Enter key, to delete a previously assigned MSN number to POTS port 2 (N=3 or 4 or 5)

- Using AT commands assign MSN numbers to the serial data port.

Type :

at&ziN= MSN number, to assign an MSN number to the serial data port

The number N takes the values:

N=6, for the first MSN port number

N=7, for the second MSN port number

N=8, for the third MSN port number

at&ziN= Enter key, to delete a previously assigned MSN number to the serial data port (N=6 or 7 or 8)

- To see the MSN numbers assigned to the two analogue ports (POTS1 and POTS2) and the serial data port type:

at&zi?

It has to be considered that the above adjustments are permanently stored in netMod's memory.

3.12. CALL DIVERSION (CFU, CFB, CFNR)

When call diversion is activated all incoming calls that concern a subscriber number (MSN) of the called subscriber, are forwarded conditional or unconditional to another number destination pre-selected by the called subscriber.

The Call Diversion service is directly connected with the Multiple Subscriber Number service. The user has to assign MSN numbers to the analogue ports of netMod to make the call diversion service functional.

Up to three different MSN numbers can be assigned to each analogue port, and are stored in netMod's corresponding memory locations. For each assigned number MSN, the call diversion service can be activated / deactivated. The adjustments concerning this service are permanently stored in netMod's memory.

3.12.1. CALL FORWARDING UNCONDITIONAL (CFU)

The function of this service demands the assignment of MSN in the corresponding port. When call forwarding unconditional is activated all incoming calls that concern a subscriber number (MSN) of the called subscriber, are forwarded to another pre-selected number destination.

- The call forwarding unconditional for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3')is activated by pressing:

21 and then dialling the destination number and finally *X#. X takes the values '1' or '2' or '3'

- The call forwarding unconditional for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3')is deactivated by pressing:

#21*X#. X takes the values '1' or '2' or '3'

- The inspection if the call forwarding unconditional service is supported from the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing:

*#21*X#. X takes the values '1' or '2' or '3'

If the ISDN subscriber's exchange is using the FUNCTIONAL protocol for the supplementary services the subscriber will hear on his handset:

- continuous tone, when the service is supported

- interrupted tone, when the service is not supported

If the ISDN exchange is using the KEYPAD protocol the subscriber will hear on his handset a message.

The parameter *X is optional. If it's not used the subscriber number that is forwarded is the one that is stored in memory location '1'.

3.12.2. CALL FORWARDING ON BUSY (CFB)

The function of this service demands the assignment of MSN in the corresponding port. When a netMod's port is busy, all incoming calls that concern a subscriber number (MSN) of the called subscriber port, are forwarded to another pre-selected number destination.

- The call forwarding on busy for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3')is activated by pressing:

67 and then dialling the destination number and finally *X#. X takes the values '1' or '2' or '3'

- The call forwarding on busy for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3')is deactivated by pressing:

#67*X#. X takes the values '1' or '2' or '3'

- The inspection if the call forwarding on busy service is supported from the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing:

*#67*X#. X takes the values '1' or '2' or '3'

If the ISDN subscriber's exchange is using the FUNCTIONAL protocol for the supplementary services the subscriber will hear on his handset:

- continuous tone, when the service is supported

- interrupted tone, when the service is not supported

If the ISDN exchange is using the KEYPAD protocol the subscriber will hear on his handset a message.

The parameter *X is optional. If it's not used the subscriber number that is forwarded is the one that is stored in memory location '1'.

3.12.3. CALL FORWARDING ON NO REPLY (CFNR)

The function of this service demands the assignment of MSN in the corresponding port. In case of no answer in an incoming call, the call is diverted to another pre-selected number destination.

- The call forwarding on no reply for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3') is activated by pressing:

61 and then dialling the destination number and finally *X#. X takes the values '1' or '2' or '3'

- The call forwarding on no reply for the subscriber number of an analogue port that is stored in a memory location X (X='1' or '2' or '3')is deactivated by pressing:

#61*X#. X takes the values '1' or '2' or '3'

- The inspection if the call forwarding on no reply service is supported from the local ISDN exchange for the subscriber number of an analogue port that is stored in memory location X (X='1' or '2' or '3') is done by pressing:

*#61*X#. X takes the values '1' or '2' or '3'

If the ISDN subscriber's exchange is using the FUNCTIONAL protocol for the supplementary services the subscriber will hear on his handset:

- continuous tone, when the service is supported
- interrupted tone, when the service is not supported

If the ISDN exchange is using the KEYPAD protocol the subscriber will hear on his handset a message.

The parameter *X is optional. If it's not used the subscriber number that is forwarded is the one that is stored in memory location '1'.

3.13. ACTIVATION OF PROTOCOLS FUNCTIONAL / KEYPAD

If the ISDN exchange is using the FUNCTIONAL protocol to activate / deactivate the supplementary services, you do not need to program anything. netMod initially supports the FUNCTIONAL protocol.

If the ISDN exchange supports the KEYPAD protocol for the activation / deactivation of supplementary services, then it has also to be activated in netMod.

Press:

**11# to activate the KEYPAD protocol

To re-establish the FUNCTIONAL protocol you have to press:

**10# to activate the FUNCTIONAL protocol

Alternatively, you can activate the KEYPAD protocol by writing on the register S100 the value '1'. If the ISDN exchange supports only the KEYPAD protocol, the supplementary services Three Party Conference and Malicious Call Identification are not supported.

The activation of KEYPAD protocol using the keypad commands is permanent. Any change is saved in "user profile 0" which becomes the "active profile" after restarting the system (hardware reset). The activation of KEYPAD protocol using S-Registers is not permanent. In this case to permanently store these changes, the user has to follow the process for permanent storage of S-Registers settings, described in chapter 11.8.1.

The following table illustrates the detailed key combinations for configuring each POTS port using an analogue telephone set.

Key combination	Description of operation
FLASH + '2' (Call Waiting)	Accepts the waiting call and places the current call on hold (if CALL HOLD supplementary service is activated). Switches between the two calls.
FLASH + '0' (Call Waiting)	Rejects the waiting call.
FLASH + '1' (Call Waiting)	Accepts the waiting call and releases the current call.
*43# (Call Waiting)	Turns call waiting on.

#43# (Call Waiting)	Turns call waiting off.
FLASH <Dial Number> (Three party conference)	Makes an enquiry call.
FLASH + '2' (Three party conference)	Switches between callers during an enquiry call. Splits up a three party conference when it has been established.
FLASH + '1' (Three party conference)	Releases the current call and retrieves the call on hold.
FLASH + '3' (Three party conference)	Creates a three party conference call.
FLASH + '*39#' (Malicious Call Trace)	Sets the Malicious Call Trace during a call.
31<Dial Number>	Restricts presentation of CLI on a call-by-call basis.*
#31#	Enables presentation of CLI.*
*31#	Restricts presentation of CLI permanently.*
**8X#	X = '0' or '1'. Defines which POTS device will remain active when both POTS devices are active and the main power supply breaks down. When X = '0' it remains active the device connected to port POTS 1. When X = '1' it remains active the device connected to port POTS 2.
**9X*<MSN>#	X='1' or '2' or '3'. Writes the desired MSN to non-volatile memory location X.
**9X*#	X='1' or '2' or '3'. Deletes the MSN number that is stored to non-volatile memory location X.
FLASH + '*19#'	Suspends an active call.
**90*<MSN>#	Assign an MSN number that will be forwarded to the B-subscriber as CLIP information.
#19#	Resumes a suspended call.
21<Dial Number>[X]#	Turns Call Forward Unconditional on.**

#21[*X]#	Turns Call Forward Unconditional off.
#21[X]#	Checks if Call Forward Unconditional is on.
67<Dial Number>[X]#	Turns Call Forward on Busy on.**
#67[*X]#	Turns Call Forward on Busy off.
#67[X]#	Checks if Call Forward on Busy is on.
61<Dial Number>[X]#	Turns Call Forward on No Reply on.**
#61[*X]#	Turns Call Forward on No Reply off.
#61[X]#	Checks if Call Forward on No Reply is on.
**1X#	X = '0' or '1'. Enables either FUCTIONAL or KEYPAD protocol for ACTIVATION / DEACTIVATION of the supplementary services***
*89#	Turns pulse metering on.
#89#	Turns pulse metering off.
**71#	Turns delayed clear back off
**70#	Turns delayed clear back on
*77#	Activates Connected Line Restriction
#77#	Deactivates Connected Line Restriction
*85#	Allows the transmission of the CLIP signal
#85#	Restricts the transmission of the CLIP signal

Table 1: Activation of the supplementary services

- These facilities are operational if the user is subscriber of CLIR service on a call by call basis.

****** [*X] parameter is optional. It takes values '1' or '2' or '3' and is used to make forward either MSN 1 or MSN 2 or MSN 3. If [*X]is missing the default MSN that is forwarded is MSN 1.

******* For ISDN Exchanges that do not support ETSI procedures for ACTIVATION / DEACTIVATION of the supplementary services [X] parameter must be '1'.

3.14. SUPPLEMENTARY SERVICES AND TERMINAL EQUIPMENT

netMod offers three different types of terminal equipment (POTS terminal, ISDN terminal, Personal Computer) and various supplementary services to the user. For the best use of terminal equipment connected to netMod, attention must be given when using supplementary services, during establishment, duration or answer of a call.

3.14.1. CONNECTING A TERMINAL EQUIPMENT TO S-INTERFACE PORT

It has to be considered that:

- netMod does not activate / deactivate supplementary services for the S-Interface port. Signalling and data concerning this port are transferred transparently through the netMod. The subscriber, using the user's instructions of terminal equipment connected to the S-Interface port, can activate / deactivate the supplementary services in each equipment.

- netMod does not program MSN numbers in the S-Interface port. Programming of MSN numbers, is done in the equipment connected to that port. Each of these equipment, compare the called party number of the incoming call, with the programmed MSN numbers stored in its memory. The equipment will accept the call when the called party number is identical with one of the MSN numbers programmed in the equipment. If there are no programmed MSN numbers in the equipment, it accepts all the incoming calls.

3.14.1.1. CONNECTING A VIDEOPHONE EQUIPMENT

Many videophones interchange with the ISDN exchange the same information with that one of an embodied ISDN modem in netMod, for the resumption-answer of a call.

For this reason, the following are suggested to answer a call:

- Assign MSN numbers (MSN service) to the serial data port, to avoid the case of an answer from a PC connected to netMod's serial port in a videophone's call. In case of an incoming videophone call, the call must have a called party number different from the MSN number assigned in the serial data port.

- Assigning MSN numbers, forces netMod to compare the called party subscriber number that follows an incoming call, with the MSN numbers of

each port. After this comparison the call will be driven in the port that the assigned MSN number is identified with the called party number of the call. If the called party number is not identical with none of the MSN numbers assigned to the analogue POTS ports or the serial ports, it will be driven transparently to the S-Interface port.

When a videophone equipment is connected to the S-Interface port, it is suggested:

- To program MSN numbers on the videophone device (netMod does not program MSN numbers on S-Interface). In case of an incoming videophone call, the call will be transparently driven in the S-Interface port, because when a port does not have assigned MSN numbers, it accepts all the calls. The videophone then, will compare the called party number of the incoming call with the programmed MSN numbers. If the called party number is identical with an MSN number, the videophone will accept the call.

3.14.2. CONNECTING A FAX OR AN ANALOGUE MODEM

When a FAX or an analogue Modem is connected in an analogue netMod's port, it is suggested:

- To deactivate the CW (Call Waiting) service on this port. An audio tone is generated when this service is active and can interrupt the forwarding of a FAX or an analogue modem connection.

- To assign on this port MSN numbers. In this case the incoming calls from the FAX or the analogue modem, must have the called party number identical with one MSN number of the port that the FAX or the analogue modem is connected. Assigning MSN numbers, prevents the equipment from answering a call that does not concern them.

3.14.3. COMMUNICATION WITH ANOTHER ISDN MODEM

In case of incoming data call from another ISDN modem, it is suggested:

- To assign MSN numbers to the serial data port. In the case of an incoming call from another ISDN modem, the call should have the called party number identical to one of the MSN numbers assigned in the serial data port.

Attention:

- When the analogue or the serial port do not have assigned MSN numbers, it accepts any call (netMod does not make any number comparison).

- When the equipment connected to the S-Interface port does not have programmed MSN numbers on its memory, it accepts any call.

4. COMMUNICATION PROTOCOLS

4.1. POINT-TO-POINT PROTOCOL

This protocol has been designed with the aim to allow **interoperability** , i.e. to enable equipment of many different vendors to communicate over point-to-point links. Initial deployment was over short local lines, leased lines and POTS using modems. However, after packet services and higher speed lines were introduced, PPP has been easily deployed in these environments as well.

PPP was first proposed as a standard in 1990 to replace an older defacto standard known as SLIP (Serial Line Internet Protocol). Now it is a recommended standard by the Internet Advisory Board (IAB) and represented by a series of RFCs (Request For Comments) produced by the Point-to-Point Protocol Working Group of the Internet Engineering Task Force (IETF). For instance "PPP over ISDN" is described in RFC 1618.

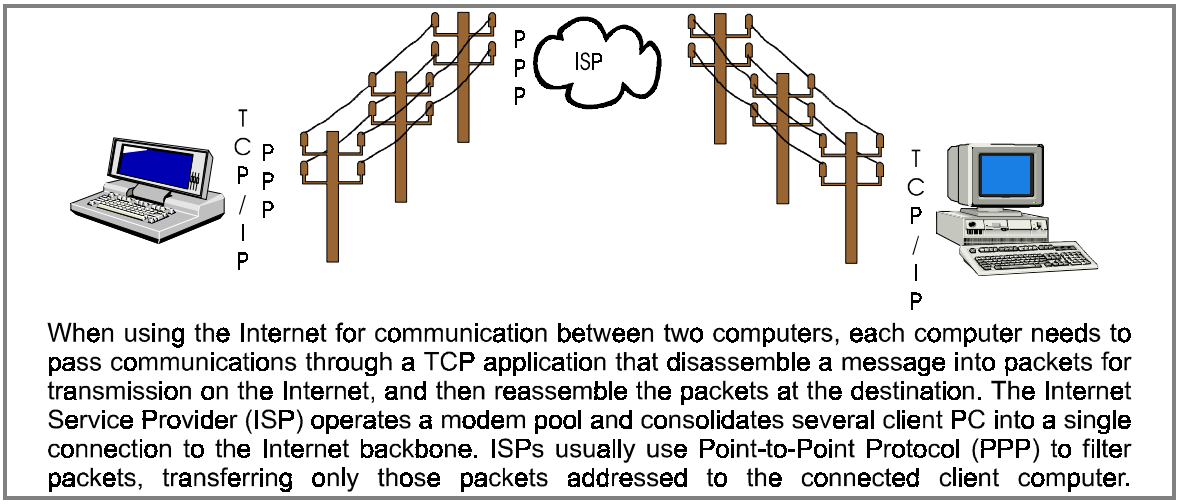

TCP/IP
PPP
PPP
ISP
TCP/IP
When using the Internet for communication between two computers, each computer needs to pass communications through a TCP application that disassemble a message into packets for transmission on the Internet, and then reassemble the packets at the destination. The Internet Service Provider (ISP) operates a modem pool and consolidates several client PC into a single connection to the Internet backbone. ISPs usually use Point-to-Point Protocol (PPP) to filter packets, transferring only those packets addressed to the connected client computer.

Fig. 5: Interconnection through PPP

The three main components of PPP are the following:

- **the encapsulation scheme,** which is responsible for the creation of the frame and operates at the physical layer
- **the Link Control Protocol (LCP)**, which, as its name suggests, controls the link and operates at the data link layer and
- **the Network Control Protocols**, which manage the network layer protocol.

4.1.1. PHYSICAL LAYER

PPP is a full-duplex, bit-oriented protocol that can run over synchronous or asynchronous links. PPP uses a variant of High Speed Data Link Control (HDLC) as the basis for encapsulation.

Most ISDN routers use bit-oriented HDLC framing, otherwise called synchronous transmission. In contrast, most PCs still transmit asynchronously. Therefore, in order for such pieces of equipment to communicate conversions between asynchronous and synchronous should take place. NetMod performs this task. PPP HDLC framing is described in RFC 1662.

4.1.2. DATA LINK LAYER

The LCP, through a four-phase process, establishes the link between the two peers and negotiates configuration options. These phases are **link establishment** and **negotiation**, **authentication**, **link quality determination** and **link ready**. Phases 1 and 4 are absolutely essential for the establishment of communication while phases 2 and 3 are optional and totally dependent on the PPP implementation at the two ends of the link.

4.1.3. AUTHENTICATION

After the establishment of a link, security reasons order the authentication of the peer, i.e. the other end of the link. The most widely used authentication methods are Password Authentication Protocol (PAP) and Challenge Handshake Authentication Protocol (CHAP), with the latter being more secure than the former as it uses encryption. The authentication from the netMod towards the PC is always PAP. As it is possible that the other end of the link (ISP) supports CHAP, netMod performs PAP/CHAP conversion.

CHAP is described in RFC 1994 and PAP in RFC 1334.

4.2. MULTILINK PPP

The ability to bundle together both B channels of an ISDN BRA into one single 128 kbps link is provided by this protocol. This has to be negotiated during the link establishment phase by both ends of the PPP link.

Thus, when Multilink PPP is active both B channels may be dedicated to a data call. If however, the user wishes to place or answer a voice call from one of the analogue devices connected to the analogue ports, netMod automatically drops one channel. When the voice call ends, netMod is capable of re-establishing the channel. It is also possible to use one or two B channels for a data call depending on the traffic on the ISDN links. NetMod's feature Bandwidth On Demand (BOD) allows for the monitoring of the link and when for instance both channels are used into a single 128 kbps link and the traffic is light it drops automatically one channel. Similarly, when only one channel is used and the traffic is high BOD may establish the second B channel in order to increase the bandwidth.

Under Multilink PPP, call request and link drop use Bandwidth Allocation Control Protocol (BACP) and Bandwidth Allocation Protocol (BAP).

Multilink PPP is described in RFC 1990.

5. TRANSPARENT MODES

For applications like voice or fax through the PC (with proper software running in the PC) the netMod passes data transparently from the serial port (RS232) to the occupied B Channel and vice versa. Then the software in the PC processes these data.

The following types of transparent modes are available:

5.1. VOICE TRANSPARENT MODE

In this mode the data received from the serial interface are transparently transmitted to the connected B-channel and vice versa. If no data are available from the serial interface, an audio pattern that corresponds to silence and depends on the coding law used in this country, is transmitted to the B-Channel. If this mode is enabled, netMod will use 3.1kHz Audio bearer capability for outgoing data calls and will accept incoming calls with Speech and 3.1kHz audio bearer capability. This means that you are able to answer a call or make one to a fax or a simple telephone. Notice however that you will only establish such a connection! The data that are received and transmitted to the computer **must** be handled by an appropriate software.

You can enable audio transparent mode by writing to S register 82 the value 76.

5.2. PPP TRANSPARENT MODE

In this mode the received and transmitted data are transferred from / to the serial port and the B-Channels in the same way as in the PPP protocol (HDLC framing with PPP heading). The only difference is that in netMod these data will pass transparently and will not influence them in any case. Only the inspection of CRC is done in each packet. When a mistake is found the packet is rejected. NetMod uses the unrestricted digital bearer capability for the outgoing calls and does not accept incoming calls of speech and 3.1kHz audio. The transmitted and received data from / to the PC have to be worked out through the proper software.

You can activate the PPP transparent mode by writing on the S82 Register the value 78.

5.3. DATA TRANSPARENT MODE

This mode is used for the direct communication between netMods. All the data are received and transmitted transparently from /to the serial port, but they are received and transmitted with an HDSL framing from / to B-Channels. In this mode, netMod uses the unrestricted digital bearer capability for the incoming / outgoing calls. It does not accepts calls with speech or audio 3.1kHz Audio bearer capability. Use this mode for direct communication with another netMod that also uses this mode. Use a simple communication program (like Hyper Terminal). You can not use this mode for communication with other modems.

You can activate the Data Transparent Mode by writing on the S82 Register the value 80.

6. FIRMWARE UPDATE

One of the basic features of the Intracom netMod is the ability to update the firmware. In order to do so you must have a correct Intracom netMod firmware file. You can get a copy of the latest software version of the modem from the Internet. The loading procedure is by itself very simple. If you use a general purpose communication program, do the following:

- Assuming that your modem is already connected to your computer and is turned on, issue the ATUPX command.

- The modem will ask confirmation for your selection since this procedure **IS NOT** reversible. If you answer `'Y'` you **MUST** download new firmware to your modem in order to make it operational again, so before you answer `'Y'` make sure that you have a correct copy of a netMod's firmware file.

- Now set the communication program to operate at 115200bps 8N1 with no hardware flow control and use the XMODEM protocol to download the file. If something goes wrong (power failure etc.) or your modem does not operate normally after the download is finished, simply restart your modem and try the above procedure from the beginning.

7. REMOTE MANAGEMENT

Intracom netMod may provide the capability of remote accessing each device to control and check its operational parameters and working condition. From a computer system (usually a PC) and through the network the system can periodically or upon administrator demand ask for a self test and change or read most of the device's operational parameters. The netMod can call the system in two cases:

- At installation time when the installation personnel programs the device with the management system's calling parameters. This is done with the use of AT commands in the netMod. Then the installed device makes a verification call, to report proper installation and for identification by the remote management system.

- At any time to report a self test failure.

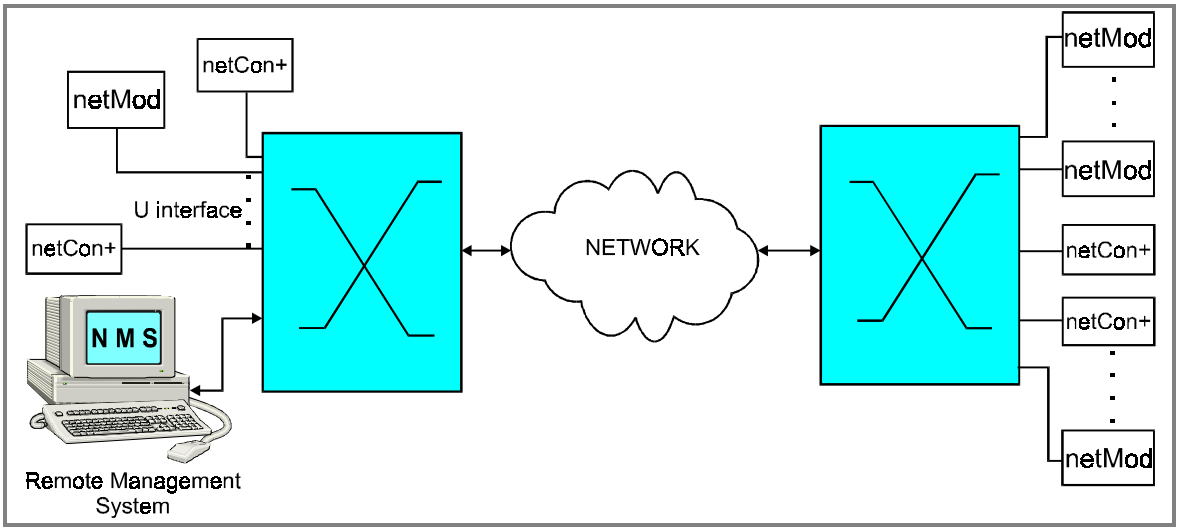


Fig. 6: Remote management

8. S-BUS CONNECTIONS

The netMod is connected with the S-bus by the following ways:

8.1. SHORT PASSIVE BUS 1

The netMod is connected to the end of the S-bus as shown in the following figure:

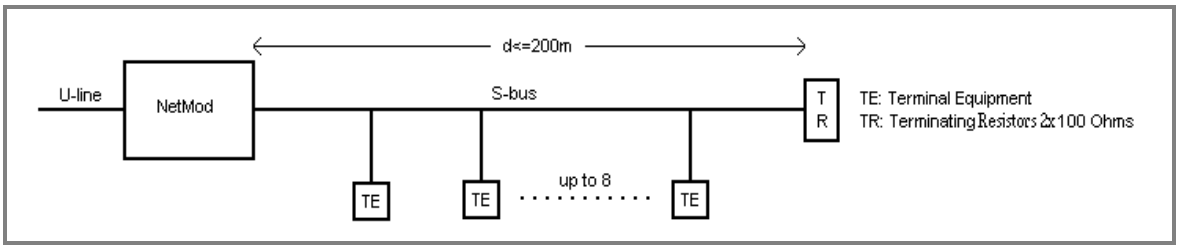


Fig. 7: Short passive bus 1 connection

The switch SW1 has to be in position "ON" and the switch SW4 has to be in position "OFF". The approximate value 200m is given for high capacitance cable (120nF/km).

The S-bus is connected to one RJ45 receptacle. It has to be terminated with two 100 ohm resistors as indicated in the above figure. Up to 8 Tes may be connected at random points along the S-bus.

8.2. SHORT PASSIVE BUS 2

The netMod is located within the S-bus as shown in the following figure:

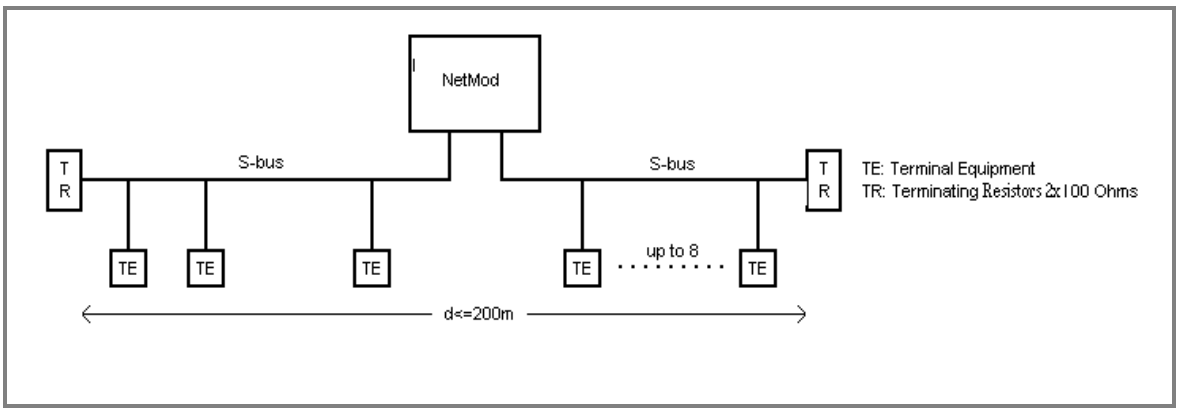


Fig. 8: Short passive bus 2 connection

The switch SW1 has to be in position "OFF" and the switch SW4 has to be in position "OFF". The approximate value 200m is given for high capacitance cable (120 nF/km).

Both RJ45 receptacles are used to connect the S-bus. Each end of the S-bus has to be terminated with two 100 ohm resistors as indicated in the above figure. Up to 8 Tes may be connected at random points along the S-bus.

8.3. EXTENDED PASSIVE BUS

The netMod is connected to the end of the S-bus as shown in the following figure:

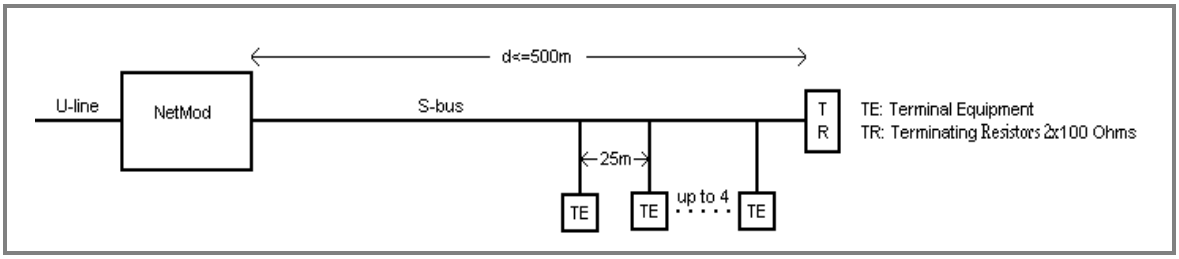


Fig. 9: Extended passive bus connection

The switches SW1 and SW4 have to be in position "ON". The approximate value 500m is given for high capacitance cable (120 nF/km).

The S-bus is connected to one RJ45 receptacle. It has to be terminated with two 100 ohm resistors as indicated in the above figure. Up to 4 Tes may be connected at the far end of the S-bus from the netMod. The differential distance between TE connection points must be 25m.

8.4. POINT-TO-POINT

In a point –to- point connection, only one TE may be connected to the netMod via a S-bus line of a maximum length of 1000m with maximum attenuation of 6dB.

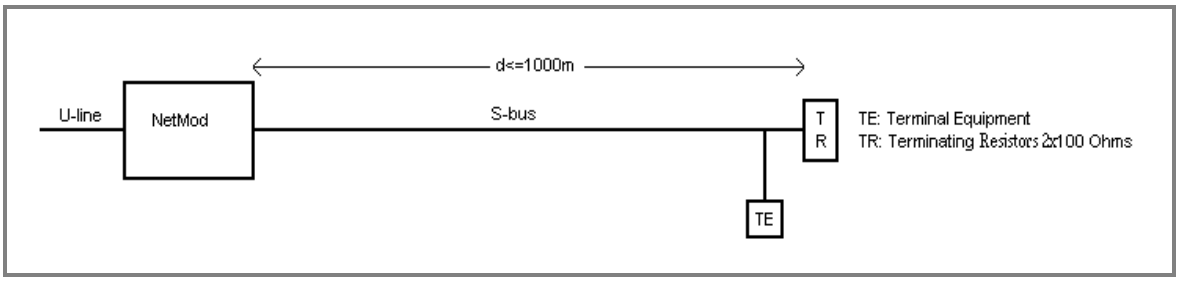


Fig. 10: Point-to-point connection

The switches SW1 and SW4 have to be in position "ON". The approximate value 1000m is given for high capacitance cable (120 nF/km). The S-bus is connected to one RJ45 receptacle. It has to be terminated with two 100 ohm resistors as indicated in the above figure.

NOTE : Termination of the S-bus for any configuration, is accomplished when terminating the transmit and the receive pair with 100 Ohm each (see also RJ-45 connector for the S/T Interface).

9. SWITCH SETTINGS AND INDICATORS

Switch settings

The netMod can be locally configured by means of switch settings on the motherboard. These settings described below, concern the new firmware version (H/W version V01).

The following functions can be set :

- S-bus configuration
- S-bus termination
- Emergency phone
- System restart

Function	Switch	Position	Operation
S-interface configuration	SW4	ON* OFF	extended bus configuration short bus configuration
Emergency Phone Selection	SW3	ON OFF*	ISDN device in operation when main supply fails POTS device in operation when main supply fails
Termination at the S-interface	SW1	ON* OFF	100Ω without termination
System Restart	SW2	Push-button	Restarts the system

* Factory Settings

Table 2: Settings of the switches on the motherboard (netMod) card

Indicators

There is one green led indicator on the top side of netMod's non removable cover that is lit when AC mains power is available.

There are also four more leds on the non removable cover, described in the table below:

LED	STATUS	FUNCTION
R.P.	Continuously ON (green)	Remote Power from ISDN Exchange
	OFF	No Remote Power from ISDN Exchange
LINK	Continuously ON (green)	The U-link is fully synchronised
	OFF	The U-link is not synchronised
B1	Flashing (green)	B1 channel is occupied (voice)
	Flashing (orange)	B1 channel is occupied (data)
	OFF	B1 is not occupied
B2	Flashing (green)	B2 channel is occupied (voice)
	Flashing (orange)	B2 channel is occupied (data)
	OFF	B2 is not occupied

In the figure below, netMod's switches and connectors are shown.

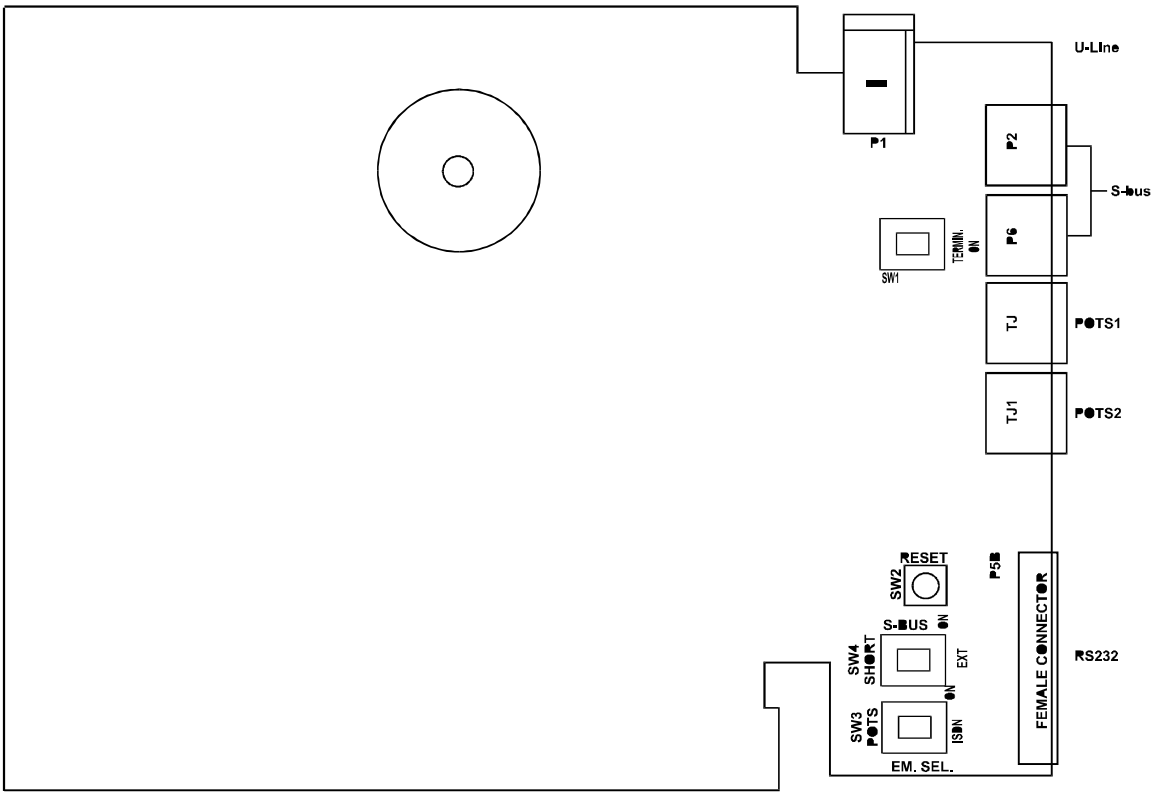


Fig. 11: PCB layout of the motherboard (netMod) card

10. TECHNICAL CHARACTERISTICS

U-Interface

- ***In compliance with*** : ETSI ETR 080, ANSI T1.601-1992, FT CS3211
- ***Line code*** : 2B1Q
- ***Output Level*** : 2.5V peak at 135Ω Load
- ***Carrier*** : twisted copper pair
- ***Bit rate*** : 160 kbps
- ***Net bit rate*** : 144 kbps
- ***Interface*** : RJ-11 jack or two-contact screw-type terminal block
- ***Range*** :

Distance	Wire Diameter
> 4 km	0.4 mm
> 6 km	0.6 mm
> 13 km	0.8 mm

S-Interface

- ***In compliance with*** : ETSI 300 012,ITU-I.430, ANSI T1.605
- ***Line code*** : AMI
- ***Output Level*** : 750mV peak
- ***Carrier*** : 4-wire passive bus
- ***Bit rate*** : 192 kbps
- ***Range*** : 1 km with one TE; point-to-point 200m with eight TEs; short passive bus
- ***Interface*** : telephone 8-pin jack connector (RJ-45)
- ***Bus Configuration*** : Adjustable by switches
  Termination Resistors
  Short / Extended

a/b (POTS) Interface

- ***Voice Circuit*** : according to ITU-T Q.552
- ***Charging Pulses*** : 16kHz sinewave pulses, level >- 10dBu
- ***Dialling*** : DTMF/Pulse
- ***Voice encoding*** : A-law

- ***VF output level*** : -7dBr
- ***VF input level*** : 0dBr
- ***Locally generated tones*** : according to ETS 300 245-7
- ***Line termination impedance*** : 600 Ω
- ***Subscriber loop voltage*** : ON-HOOK: 48V +/-2V
- ***Subscriber loop current*** : ≥20 mA
- ***Subscriber loop range (incl. Telephone set)*** : 600 Ω max.
- ***CLIP supplementary service*** : according to ETS 300 089, ETS 300 659-1, V.23 signalling
- ***Ring Generator Voltage*** : ≥40 Vrms

  (measured on 2,2Kohm + 3μF load)

- ***Ringing frequency*** : 25Hz
- ***Distortion*** < 15%

- ***Interface*** : telephone jack (RJ-11)

RS232 Interface : V24, asynchronous communication

- ***Interface*** : D-9pin connector

USB Interface (OPTIONAL) : compatible with USB spec. V1.1

Interface : USB type B receptacle connector

Power supply

- ***Normal operation*** : locally from 230 VAC (180-240), 50Hz (47-53) with power consumption <7.5W
- ***Emergency operation*** : Remote power feeding from the local exchange via U-Interface for one Terminal (ISDN or POTS).
- ***Maximum power supply voltage via the U-interface*** : 115V
- ***Minimum power supply voltage via the U-*** : 35V

interface

- ***Power Consumption on U-interface*** : < 1.7 W
- ***S-bus output voltage*** : Typical 35.6V (Min 34V, Max 42V)
- ***Power feeding to the S-bus*** :
  - 4.5 W in normal operation with mains present (From Mains)
  - 420mW in emergency operation (Through U-interface)

Environmental Conditions

- ***Operating Temperature*** : -5 ^{o}C to 45 ^{o}C / ETS 300019-2-3 class 3.2
- ***Storage Temperature*** : -5 ^{o}C to 45 ^{o}C / ETS 300019-2-1 class 1.1
- ***Transport*** : -40 ^{o}C to 70 ^{o}C / ETS 300019-2-2 class 2.3
- ***Humidity*** : Up to 95%RH, 0^{o}C to 45^{o}C

Safety and Protection

- ***In compliance with*** : EN 60950, ITU-T K22, ETS 300 047

  ITU-T K41, France Telecom CSE I31-21

Electromagnetic Compatibility and Interference (EMC/EMI)

- ***Emission*** : EN 550 22 Class B
- ***Immunity*** : EN 500 82-1 and ETS 300386-2

Mechanical Conditions

- ***Operating*** : ETS 300 019-2-3 class 3.2
- ***Storage*** : ETS 300 019-2-1 class 1.1
- ***Transport*** : ETS 300 019-2-2 class 2.3

Status Indication

- ***AC Power Supply status*** : 1 green LED

Software compatibility

- ***Layer 1*** : ETR-080 and ETSI 300 012
- ***Layer 2*** : ITU Q929, Q921 and ETSI 300125
- ***Layer 3*** : ITU Q930, Q931 and ETSI 300 102-1, ETSI 300 102-2
- ***Supplementary services*** : CFU : ETS 300 200,

  CFB : ETS 300 199,

  CFNR : ETS 300 201,

  CW/CH :ETS 300 056, ETS 300 139,

  MCI : ETS 300 128,

  CLIP/CLIR :ETS 300 089, ETS 300 659-1,

  3PTY : ETS 300 186,

  TP : ETS 300 053
- ***Point to Point Protocol (PPP)*** : RFC 1661, RFC 1618
- ***Multilink PPP*** : RFC 1990
- ***PAP/CHAP Conversion*** : RFC 1994
- ***Bandwidth Allocation Protocol*** : RFC 2125

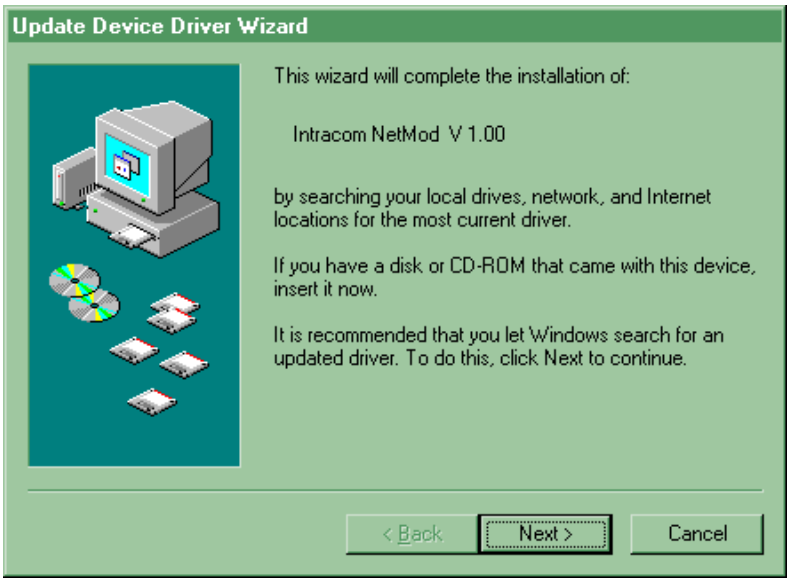
11. SET UP AND CONFIGURATION

netMod can be easily set up and work with all the commonly used operating systems (DOS, Win 3.1, Win 95, Win 98).

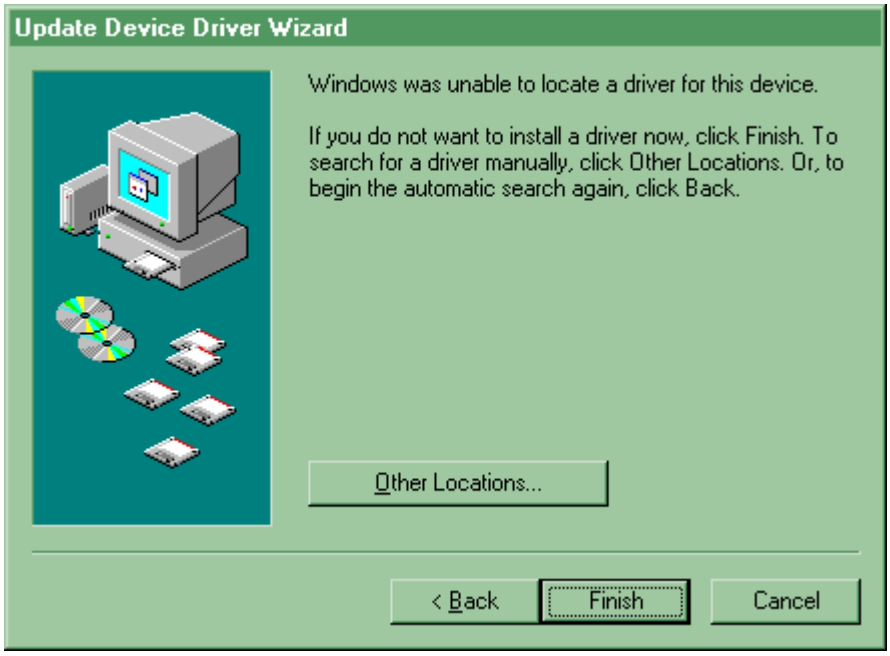
11.1. SETTING UP netMod FOR WIN 95 AND WIN 98

11.1.1. COMPUTER WITH PLUG & PLAY CAPABILITY.

Turn on the computer. Make sure netMod is already on. The computer will report that new hardware was added. It will recognise Intracom netMod and start the installation with the following dialogue box.

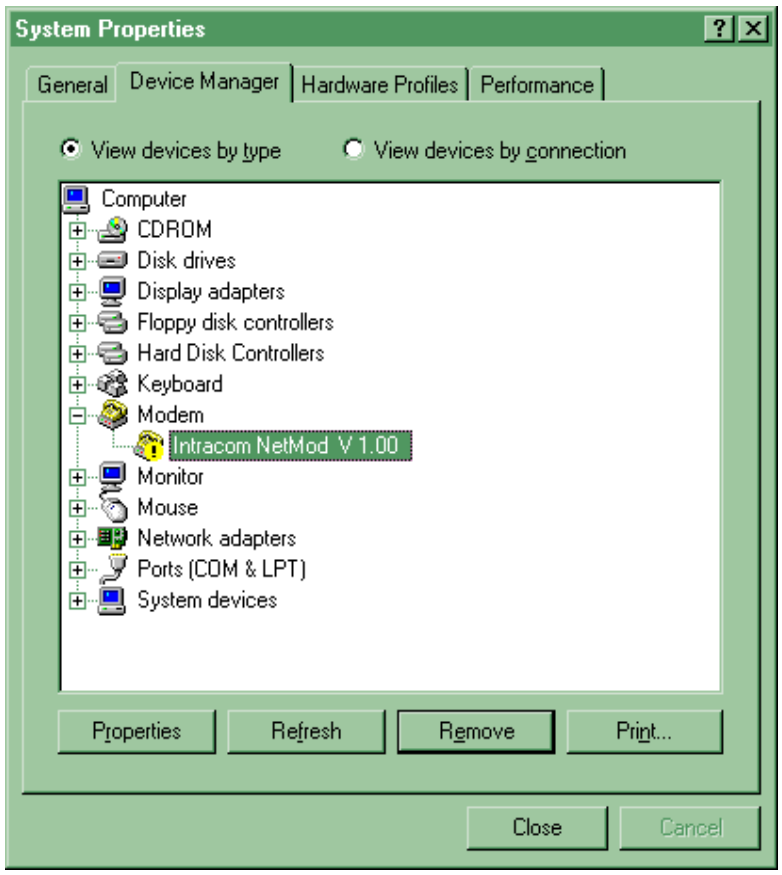

Update Device Driver Wizard
This wizard will complete the installation of:
Intracom NetMod V 1.00
by searching your local drives, network, and Internet locations for the most current driver.
If you have a disk or CD-ROM that came with this device, insert it now.
It is recommended that you let Windows search for an updated driver. To do this, click Next to continue.
< Back
Next >
Cancel

Click the `<Next>` button.


Update Device Driver Wizard
Windows was unable to locate a driver for this device.
If you do not want to install a driver now, click Finish. To search for a driver manually, click Other Locations. Or, to begin the automatic search again, click Back.
Other Locations...
< Back
Finish
Cancel

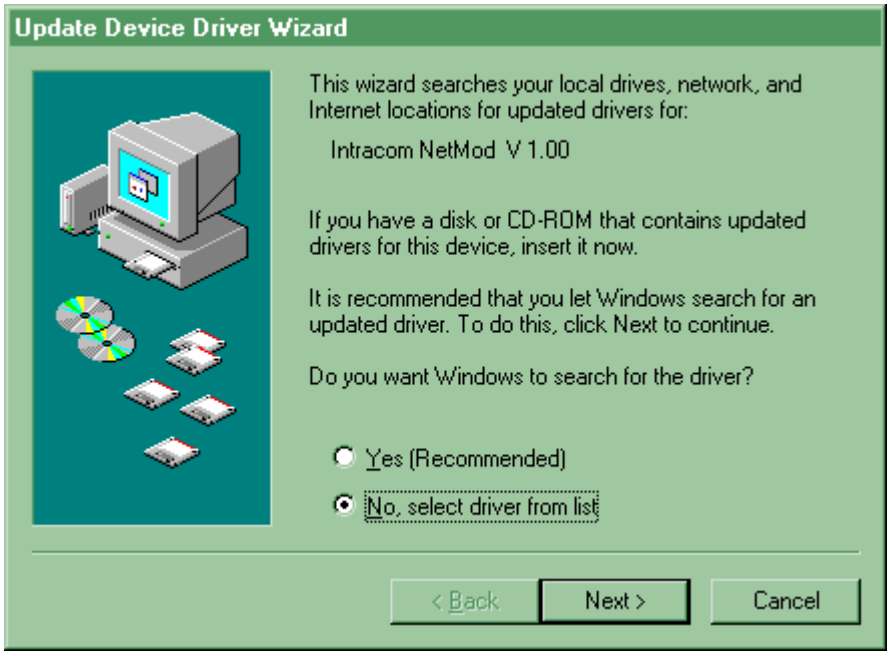
Click the <Finish> button. The modem installation is **not** completed yet! To make that the modem function properly do the following:

Open Control Panel. Double click on the System icon and select <Device Manager> page. Double click or press <+> on the Modem icon. A window that looks like this will appear on your screen:

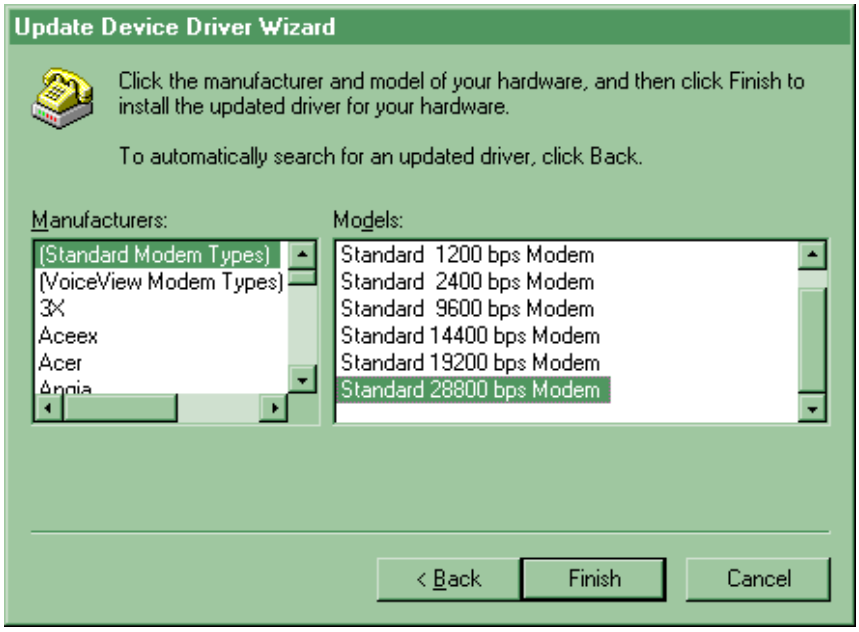


Click on the <Properties> button and select the <Driver> page on the dialogue that appears. The active window on your screen should look like this:

Click the <Update Driver…> button. On the dialogue that appears click <No, select driver from list>.


Update Device Driver Wizard
This wizard searches your local drives, network, and Internet locations for updated drivers for:
Intracom NetMod V 1.00
If you have a disk or CD-ROM that contains updated drivers for this device, insert it now.
It is recommended that you let Windows search for an updated driver. To do this, click Next to continue.
Do you want Windows to search for the driver?
Yes (Recommended)
No, select driver from list
< Back
Next >
Cancel

Now press the <Next> button. On the dialogue that appears select <Modem> and press the <Next> button again. Now from the Modems list select <Standard Modem Types> on the write window and <Standard 28800 pbs Modem> on the left. The active window should look like this:



Click the <Finish> button. A window that look like the following will appear:

Now click the <Close> button. Your modem installation is now complete.

11.1.2. MANUAL SETUP (PNP NOT SUPPORTED).

Open the Control Panel in the computer. Double click the <Add New Hardware> item. The following dialogue box appears.

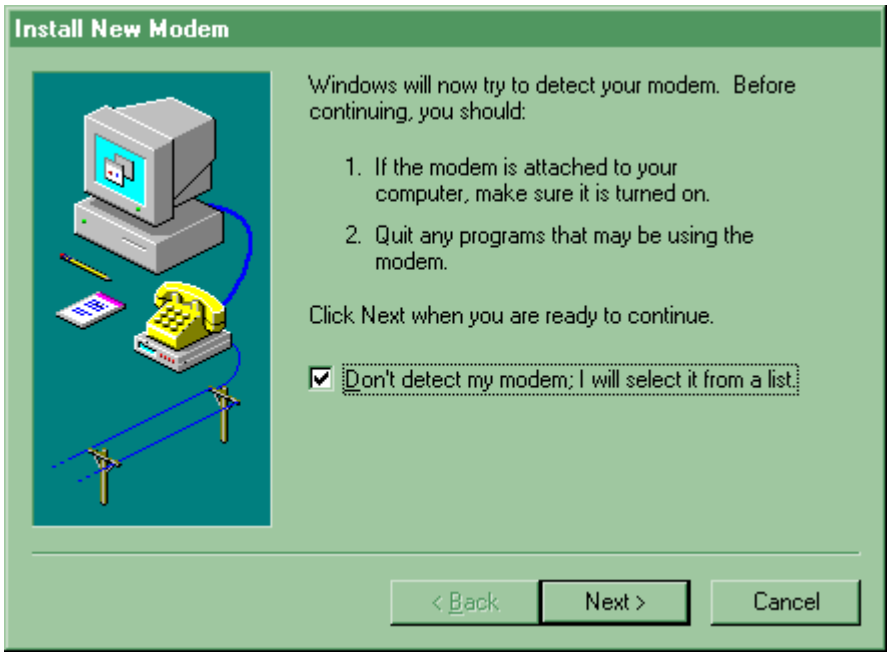
Add New Hardware Wizard
This wizard will help you quickly install a new piece of hardware.
To begin installing your new hardware, click Next.
< Back
Next >
Cancel

Click the <Next> button.

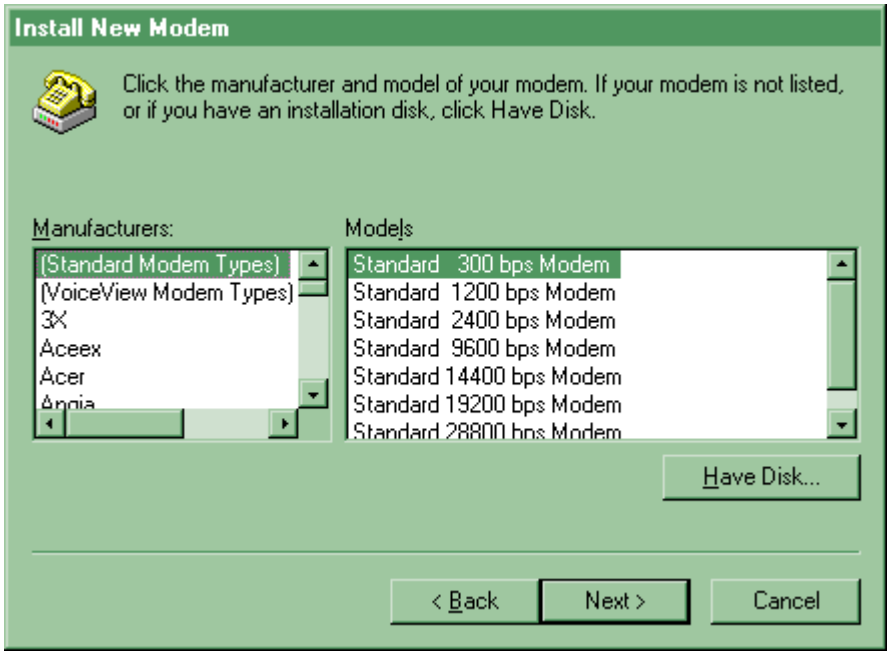
Add New Hardware Wizard
If your hardware is already installed, you should have Windows detect it.
When Windows detects new hardware, it automatically determines the current settings for the device and installs the correct driver.
Do you want Windows to search for your new hardware?
Yes (Recommended)
No
< Back
Next >
Cancel

Select <No> when the computer asks to allow Windows to search for your new hardware and click <Next> again.

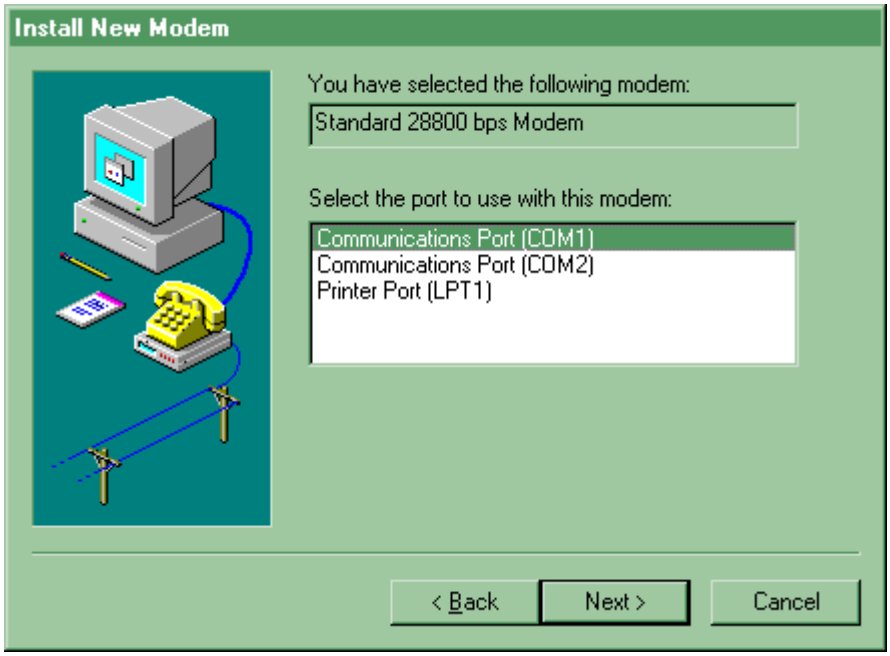
Select <Modem> from the different hardware types that appear. Click <Next>.


Install New Modem
Windows will now try to detect your modem. Before continuing, you should:
1. If the modem is attached to your computer, make sure it is turned on.
2. Quit any programs that may be using the modem.
Click Next when you are ready to continue.
Don't detect my modem; I will select it from a list.
< Back
Next >
Cancel

You do not need to let your computer detect the modem. Click on the <Don't detect my modem ; I will select it from a list> selection and then on the <Next> button.



Select <Standard Modem Types> and <Standard 28800 bps Modem> instead. On the dialogue box that will appear select the correct communication port and press the <Next> button:



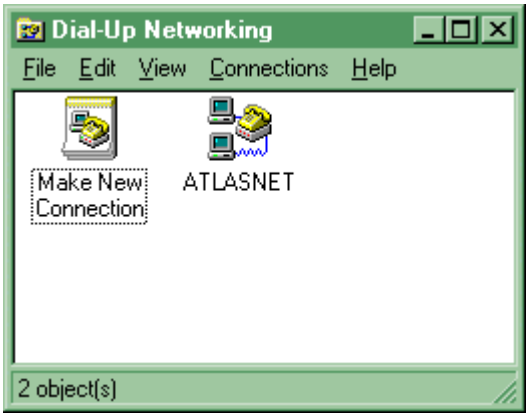
Windows will now install your modem and the following window will appear:

Install New Modem
Your modem has been set up successfully.
If you want to change these settings, double-click the Modems icon in Control Panel, select this modem, and click Properties.
< Back
Finish
Cancel

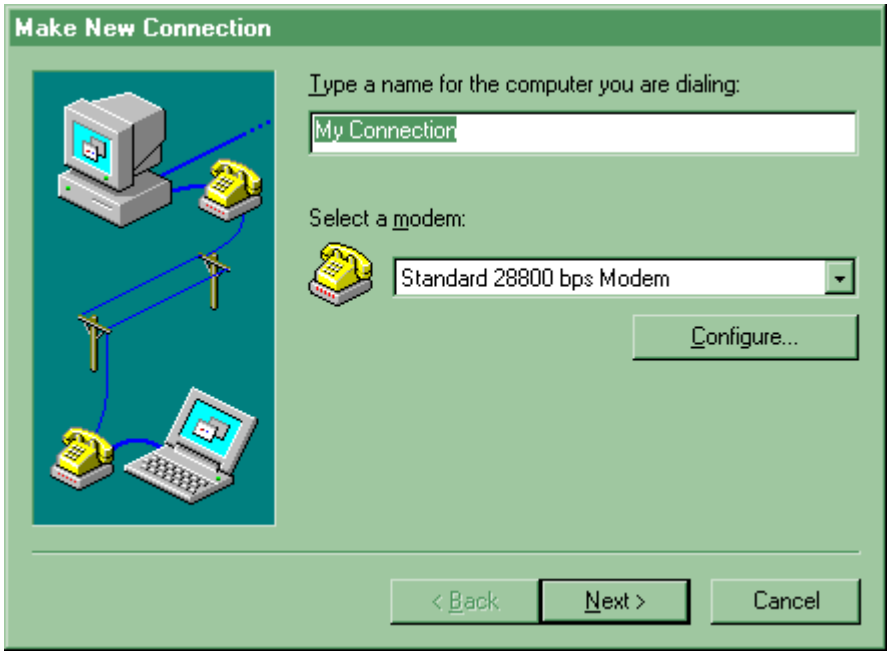
Click the <Finish> button. Your modem installation is complete.

11.2. CONNECTING TO INTERNET

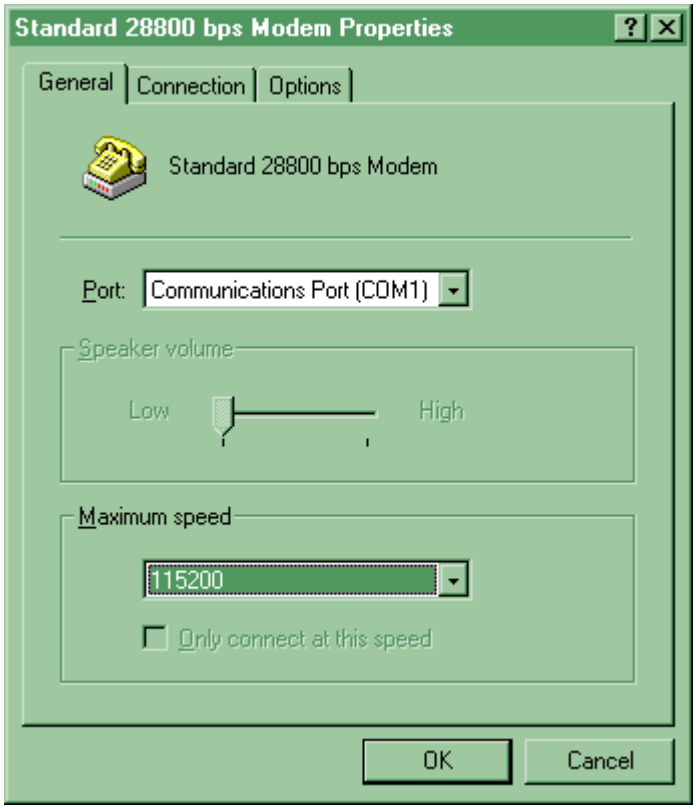
Once you have netMod installed correctly you can use it to connect to the Internet. To do so you must have an account to an Internet provider that provides ISDN Internet access. In order to add your new ISDN Internet connection open the `<Dial-Up Networking>` item in `<Accessories>` menu. If such an item does not exist you must install it with the use of your Windows 95 CD-ROM. For further information on this subject consult your Windows 95 manual. The first time you run `<Dial-Up Networking>` a window that looks like the following will appear:



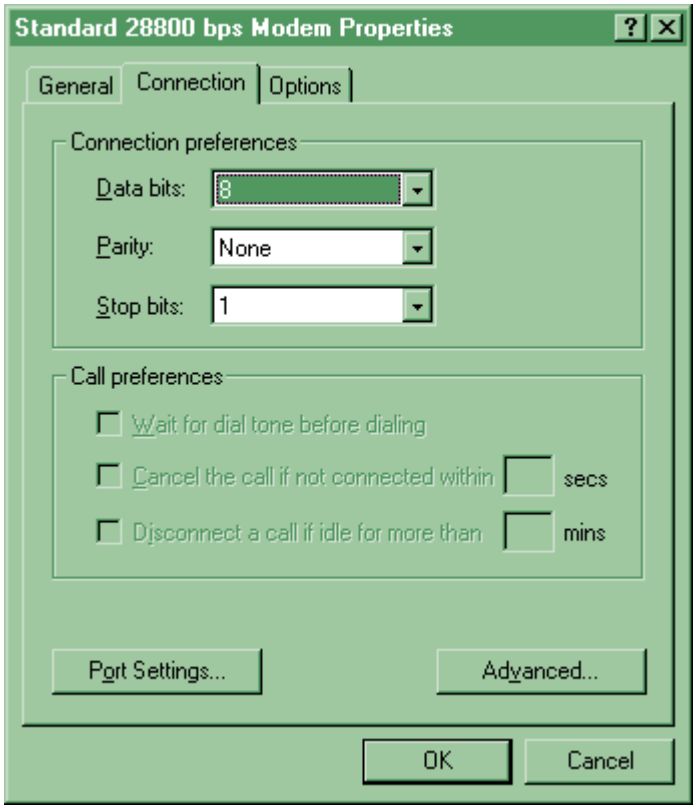
Double click on the `<Make New Connection>` item. On the dialogue box that will appear press the `<Configure>` button.

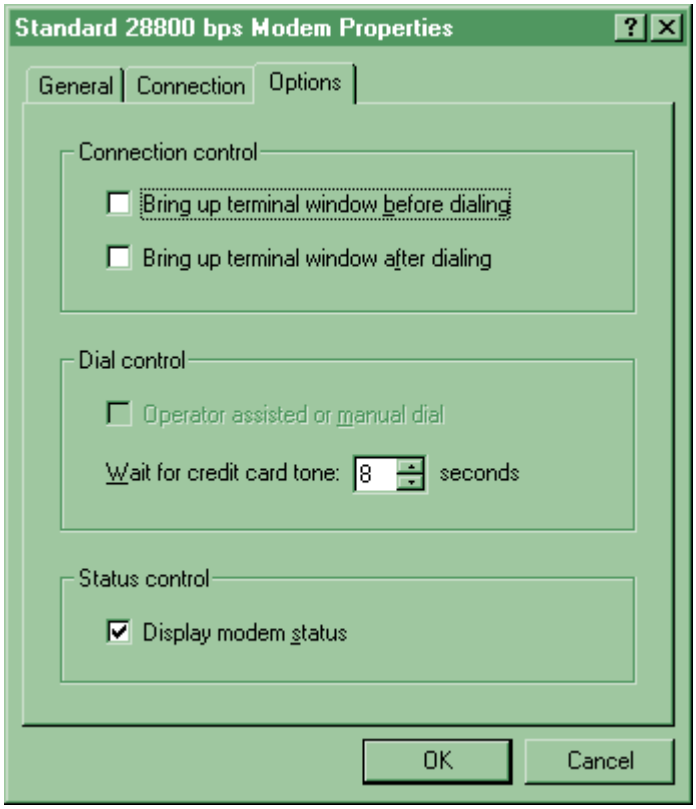


You can now adjust your connection configuration. Your active window should look like this:

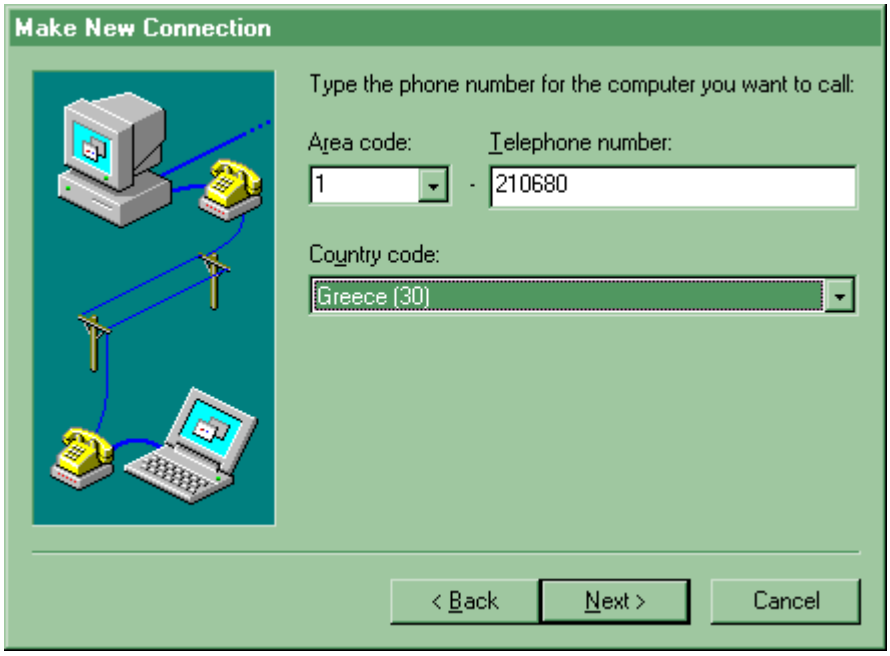


If there is a difference between the values on the above window and the one your computer displays adjust the values on your computer accordingly. Do the same for the pages <Connection> and <Options > that appear below.

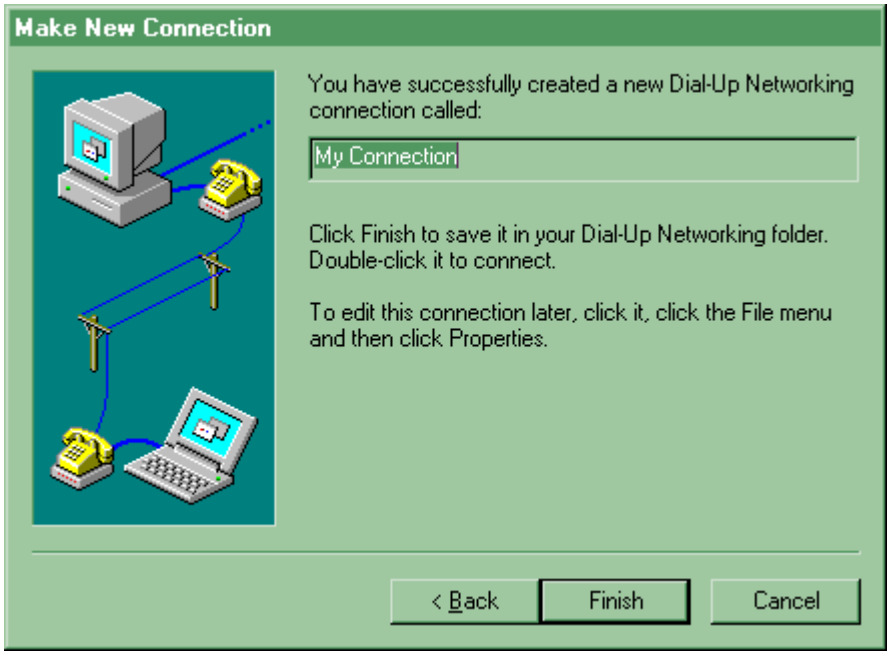




Once you have finished with the above settings press the <OK> button to return to the previous window and then press the <Next> button. The following dialogue box appears:



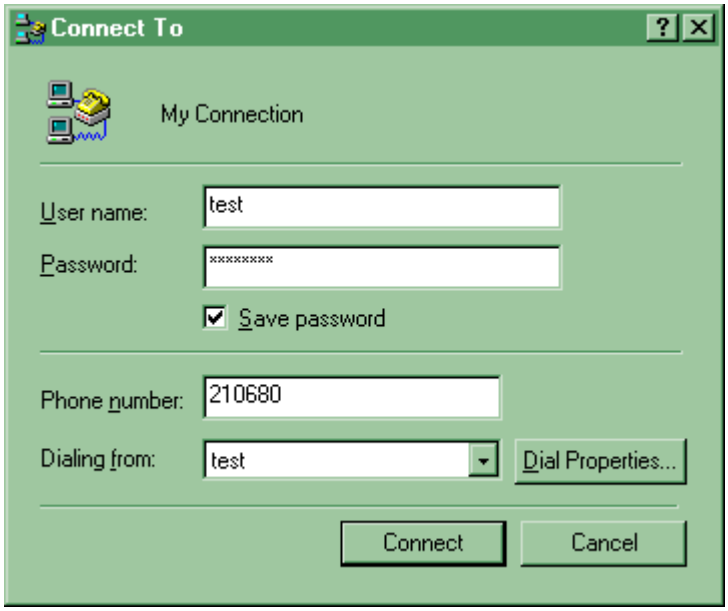
Fill in the Country Code field, the Area code field and the Telephone number field with the correct values that stand for your Internet provider. Then press the <Next> button.


Make New Connection
You have successfully created a new Dial-Up Networking connection called:
My Connection
Click Finish to save it in your Dial-Up Networking folder. Double-click it to connect.
To edit this connection later, click it, click the File menu and then click Properties.
< Back
Finish
Cancel

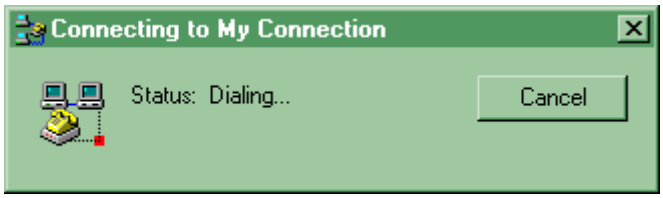
On the final dialogue box press the <Finish> button. Your new connection has been added to the <Dial-Up Networking> window.

To adjust the settings of your connection press the right mouse button and select properties. From the various pages of this menu, you can adjust all the parameters of your connection and your modem. Please refer to your windows manual and to chapter 11.2.1 for more details regarding these settings.

To open your connection now, just double click on <My Connection> icon.



On the dialogue box that appears type your User name and Password given to you by your Internet provider. Press the <Connect> button.



If all the above steps are done correctly your computer will be soon connected to the Internet and you can run a WWW browser, an ftp program or any other Internet application you like.

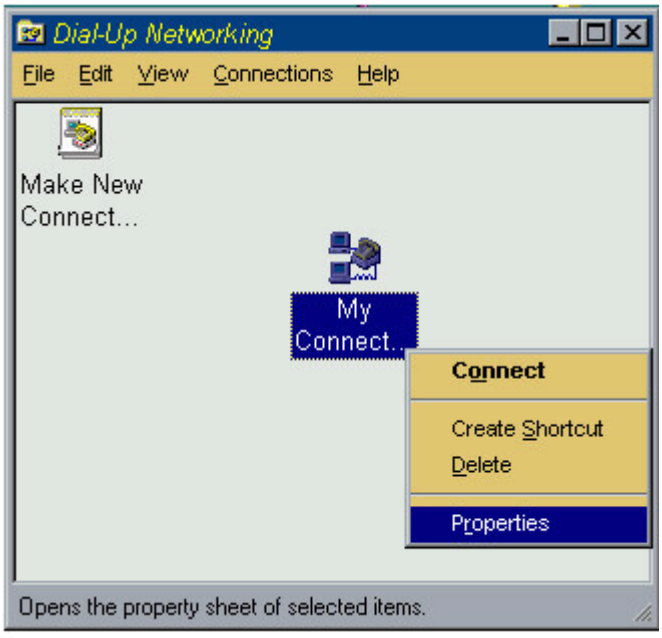
11.2.1. CONNECTING TO INTERNET USING PPP OR ML-PPP PROTOCOL

netMod's software, presumes that the negotiation for the MLPPP connection with the Internet Service Provider (ISP) is deactivated. If the user wants to use both B-channels for the connection, it has to give the command atb0 to netMod, and make it negotiate the ML-PPP. **It is important before you activate this call, to be sure that the ISP supports connection with use of protocol ML-PPP**. In each case of connection, the H/W flow control has to be activated in the computer's serial port used for the connection with netMod.

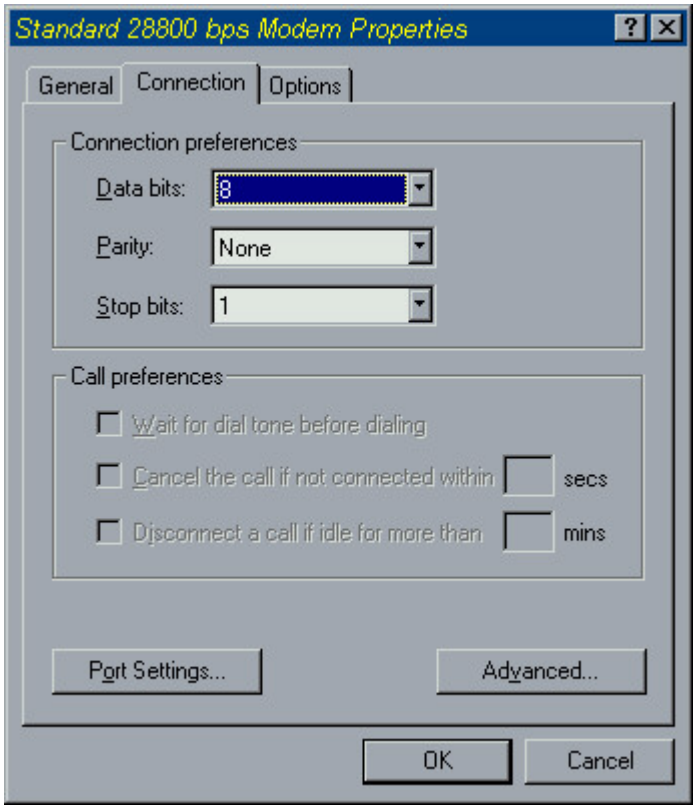
It is described below, the way of activation / deactivation of ML-PPP through the <Dial Up Networking> of windows 95/98.

Having created a connection using the <Dial-Up Networking> from menu <Accessories> in windows, you can activate / deactivate the ML-PPP when you have access to the Internet.

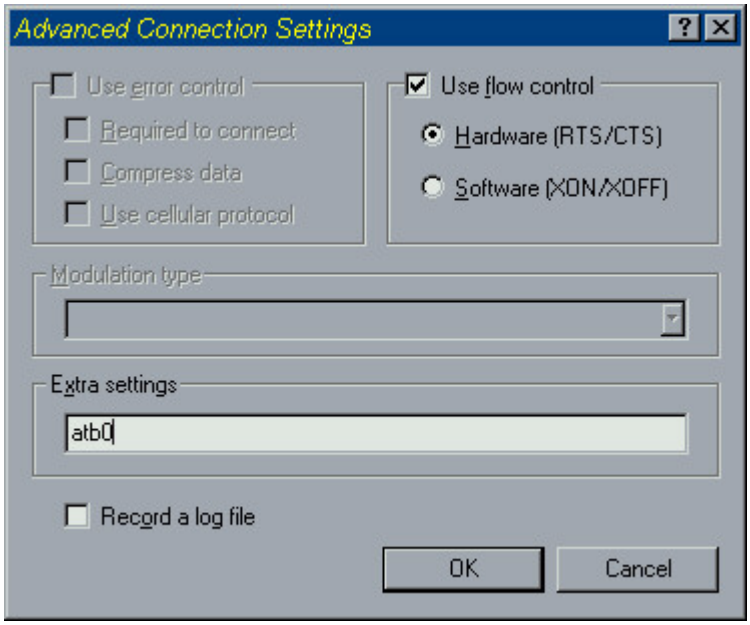
Open the window <Dial-Up Networking>, choose the connection <My Connection> that you have create and press the right mouse button. From the menu that appears, select the Properties.



From the window that appears, choose the Connection page.



Press the button Advanced. Your active window that appears is shown below.



In the area of Extra Settings give the command atb0 and then press the OK button if you want to activate the ML-PPP and to use a rate of 128Kbit/sec whenever is needed, when you access the Internet.
Or

In the area of Extra Settings give the command atb40 and then press the OK button if you want to deactivate the ML-PPP and to use a simple PPP with rate of 64Kbit/sec, when you access the Internet.

In case of a ML-PPP connection, the second B channel is added or subtracted according to the rate of transferred data (Bandwidth On Demand). When you use a B-channel and the data rate exceeds a limit for a certain time duration, the second B-channel will be added to the connection. On the other hand, when both B-channels are used and the rate drops below the limit for a certain time duration, the second B-channel will be subtracted from the connection. The limits of this rate for the addition / subtraction of B-channel, as well as the time duration for which the rate has to be above / below these limits, so that the B-channel can be added / subtracted, are defined with AT commands as shown below:

ATJAn: where n is the B-channel's addition limit, with units kilobit per second (kbps). The value programmed by the factory is 52 kbps.

ATJSn: where n is the B-channel's subtraction limit, with units kilobit per second (kbps). The value programmed by the factory is 48 kbps.

ATKAxn: where x defines the kind of time units that is x=M when it concerns minutes or x=S when it concerns seconds and n defines the time duration in the corresponding time units. When the rate during this time duration is above the limit, the second B-channel will be added. The value programmed by the factory is 20 seconds.

ATKSxn: where x defines the kind of time units that is x=M when it concerns minutes or x=S when it concerns seconds and n defines the time duration in the corresponding time units. When the rate during this time duration is below the limit, the second B-channel will be subtracted. The value programmed by the factory is 40 seconds.

Conclusively, in accordance with the factory values, when the data rate is above 52kbps for a time duration of 20sec, the second B-channel will be added. When both B-channels are used and the rate drops below 48kbps for a time duration of 40 sec, the second B-channel will be subtracted from the connection.

11.3. COMMUNICATION WITH OTHER ISDN MODEM

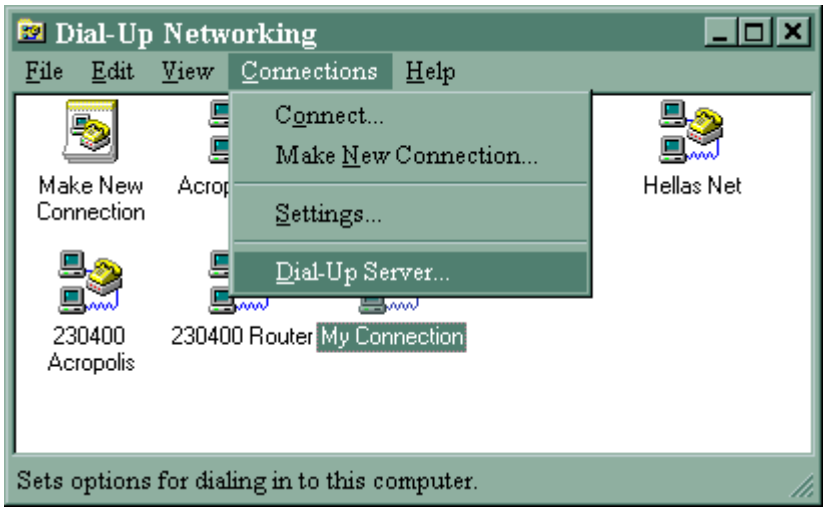
A PC connected to netMod can communicate with another PC connected in an ISDN modem (netMod or another manufacturing modem). A basic requirement to accomplish communication, is that the other modem has to use one of the communication protocols that netMod uses. netMod uses the protocols PPP, MLPPP, Transparent PPP and Voice Transparent, which are described in more details in this manual. It has to be considered that at this point netMod does not support MLPPP for incoming calls. This function will be added in the future. Besides the use of the same protocol for the possible data transfer, the proper software must be run in both PCs that need to communicate.

The software of netMod (V2.0) presumes that the negotiation for the MLPPP connection with an ISP is deactivated. When the user wants to use both B-channels for the connection, he has to give the command atb0 to netMod, in order to make a MLPPP negotiation.

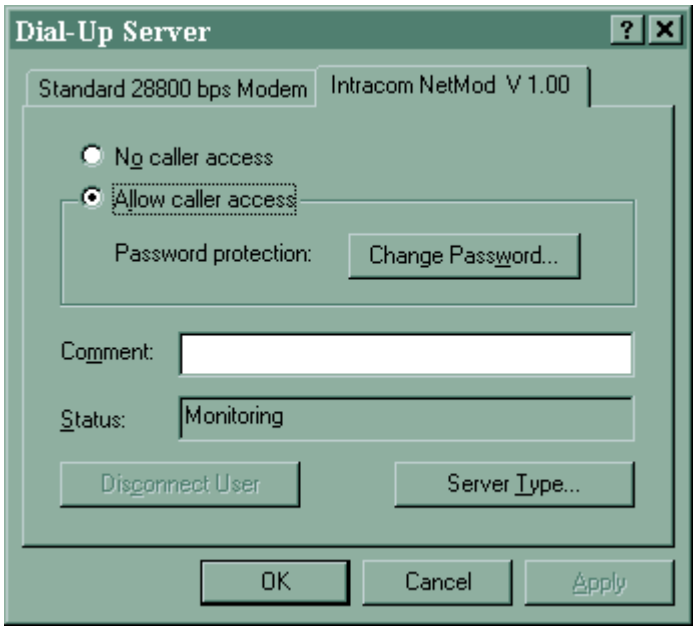
In any case of connection the H/W flow control has to be activated in the serial port of the computer used for the connection with netMod.

11.3.1. TRANSMISSION USING THE PPP PROTOCOL

As an example, for a PPP connection if you are using Windows 95, make a dial up connection. The dial number must be the one of the modem you want to communicate with. On the computer that receives the incoming call a dial-up software must be active, and waiting for the call. On Windows 95 you can activate the dial up server by selecting it from the <Connections> menu at Dial Up Networking window.



From the window that appears select your modem and click on <Allow caller access> to enable incoming calls.



When the connection is established you can access the remote computer disks (as long as file sharing has been enabled on the dial up server!). To do so you can use Find Computer from the Start Menu. Search for the computer you are connected with, using its network identification name. When the computer is found double click on the icon that appears. All the shared disks on the remote computer will appear on a new window, and you can access them the same way you access your local disks. If you use netMod to receive data calls **do not** enable MLPPP. The netMod does not support MLPPP for incoming calls at this moment. This feature will be added in the future.

11.4. AT COMMANDS

You can configure your modem with the use of AT commands and a simple communication program, (for example the Hyper Terminal of Windows 95 and Windows 98).

If you choose a communication program you can select a variety of baud rates. Your Modem will automatically recognise the selected baud rate and respond to the AT commands you issue. A baud rate of 115200bps is the usual choice. The AT commands described below, are shaped in subsequent software versions V2.0.

11.5. BASIC "AT" COMMAND SET

Command	Option	Function & Description
+++		Escape sequence code, entered in data state, wait for modem to return to command state
All the Following Commands Require an "AT" Prefix		
A		Go on-line in answer mode
Bnn		Select ISDN Teleservice 'B' must be followed by two digits
	B0	Enables Multilink PPP protocol negotiation for outgoing data calls (2B Channels bundling).
	B40	Forces PPP protocol negotiation (1B Channel). This setting is mandatory for incoming data calls.
CDn	n=0-7	Signalling Monitoring
	CD0	Disable monitoring of layer 1 (D Channel hex data) signalling
	CD1	Enable monitoring of layer 1 (D Channel hex data) signalling
	CD2	Disable monitoring of layer 2 (Q921 Decoded data) signalling
	CD3	Enable monitoring of layer 2 (Q921 Decoded data) signalling
	CD4	Disable monitoring of layer 3 (Q931 Decoded data) signalling
	CD5	Enable monitoring of layer 3 (Q931 Decoded data) signalling
	CD6	Disable monitoring of application layer signalling
	CD7	Enable monitoring of application layer signalling
	CD8 *	Disables signalling monitoring.
	CD9	Enables signalling monitoring to the serial port.
	CD10	Disables monitoring of U/S interface events.
	CD11	Enables monitoring of U/S interface events.
CH?		Displays the charging units of the last call and the total charging units per port (POTS1, POTS2 and DATA Port). The counter of the total charging units resets with every system restart or with the ATCH0 command. This function requires the activation of AOC-D supplementary service and the proper value of register S89.

CH0		Resets the counters of the total charging units and the last call's charging units.
Ds		Dial s (numbers and options) that follow. The options of s are listed as follows:
Das		Dial s (numbers and options) that follows for the analogue adapter, POTS1. The dialling of s will take place when an OFFHOOK action of POTS1 port is detected (hotline). This feature is disabled when ATDA (without s) is given.
DBs		Dial s (numbers and options) that follows for the analogue adapter, POTS2. The dialling of s will take place when an OFFHOOK action of POTS2 port is detected (hotline). This feature is disabled when ATDB (without s) is given.
DL		Repeat last ATD command
En		Command mode local echo of keyboard commands
	E0	Echo off
	E1 *	Echo on
Hn		On/off hook control for modem
	H0	Hang up modem call
	H3	Hang up the analogue adapter, POTS 1
	H4	Hang up the analogue adapter, POTS 2
In, n=0-11		Display inquired information
	I0	Display product hardware code, same as 'ATI' Results: 00 or 01
	I1	Display ROM checksum.
	I3	Display software version. Results: Software Version V X.XX
	I4	Display product name. Results: INTRACOM netMod VX.X
	I9	Display PNP string
	I11	Display PPP status
JAn	n=0-255 *52	Add-threshold for BOD (see note) in kbps unit. When data rate is above this threshold for the time interval that is specified with the Kaxn command the second B Channel will be added.
JSn	n=0-255 *48	Sub-threshold for BOD (see note) in kbps unit. When data rate is under this threshold for the time interval that is specified with the KSxn command the second B Channel will be dropped.
Kaxn	n=0-63 *20	Add-persist time interval for BOD (see note); BOD is disabled if n=0; x=M (in Minute unit) or S (in Second unit)
KSxn	n=0-63 *40	Sub-persist time interval for BOD (see note); BOD is disabled if n=0; x=M (in Minute unit) or S (in Second unit)

		Note: Bandwidth On Demand (BOD) is the function that adds or subtracts the second B Channel when MLPPP protocol is used. The time at which the second B Channel is added or subtracted depends on data rate and is defined with the JAn, JSn, Kaxn, KSxn AT commands. **If BOD is disabled and MLPPP protocol is used then both B Channels will always be "up" apart from the case in which one B Channel is used for voice call by one POTS.**
Qn	n=0-1	Result code displayed
	Q0 *	Modem returns result code
	Q1	Modem does not return result code
Sr.b=n		Set bit 'b' of S-register 'r' to value 'n'. 'n' is a binary digit '0' or '1'
Sr.b?		Display value of bit 'b' of S-register 'r'
Sr=n		Set S-register 'r' to value 'n'. 'n' must be a decimal number between 0 and 255
Sr?		Display value stored in S-register 'r'
UPX		Download firmware to the Flash EPROM
Xn, n=0-6		Dialling and connect result codes
	n=0	Respond CONNECT when connected. Respond NO CARRIER in all cases of connection failure.
	n=1	Same as X0, respond CONNECT XXXX when connected where XXXX is DCE connection speed.
	n=2	Same as X1. Additionally respond NO DIALTONE when connection fails due to no dial tone.
	n=3	Same as X1. Additionally respond BUSY and NO ANSWER when connection fails due to these reasons.
	n=4	Same as X2. Additionally respond BUSY and NO ANSWER when connection fails due to these reasons.
	n=5 *	Same as X4. Respond CONNECT XXXX/PROT when connected where XXXX is DCE connection speed and PROT is the B Channel connection protocol.
	n=6	Same as X5. Respond CONNECT XXXX/YYYY PROT when connected where XXXX is DCE connection speed, PROT is the B Channel connection protocol and YYYY is DTE connection speed (64000).
Zn	n=0-4	Reset modem and set power-on profile
	Zn	Reset modem and load user profile n (0-3)
	Z4	Reset modem and load factory settings
/CLIPLEVEL<space> n	n=0-19	Number n defines the level of FSK sequence. Larger values of n attenuate the level of FSK sequence. Default value is 2.

11.6. EXTENDED "AT&" COMMAND SET

Command	Option	Function & Description
&F		Load factory settings to RAM as active configuration
&Jn		Bundle selection
	&J0 *	Bundle connection is disabled. One B Channel will be used for data transfer.
	&J2	Bundle connection is enabled for outgoing calls. Two B Channels will be used for data transfer.
&WN	N=0-3	Write current settings to user profile n in FLASH memory for permanent storage.
&ZIN=S	N=0-8 S=phone number	MSN setting. Assign the phone number for port POTS1, port POTS2 & DTE Port(RS232). In answer mode, these numbers will be compared with the received called_party_number information. The call will be accepted if the assigned number matches with the called_party_number. The coding of N parameter is as follows:
	N=0-2	Assign the phone number 's' for analogue adapter, POTS1 N=0->MSN1, N=1->MSN2, N=2->MSN3.
	N=3-5	Assign the phone number 's' for analogue adapter, POTS2 N=3->MSN1, N=4->MSN2, N=5->MSN3.
	N=6-8	Assign MSN 's', for DTE Port(RS232) N=6->MSN1, N=7->MSN2, N=8->MSN3.
&ZI?		Display the phone number for port POTS 1, port POTS 2 & DTE Port(RS232).
&ZO?		Display the own phone number for port POTS 1, port POTS 2 & DTE Port(RS232).
&ZON=X		Write own phone number X. The number specified will be used as the calling party number while dialling (in the outgoing SETUP message). Values for "N" i = for DTE port a = analogue adapter, POTS 1 b = analogue adapter, POTS 2

11.7. BASIC S-REGISTERS "ATSN=X"

Command	Function and Description
S0=	Set the number of rings on which the modem will answer. A 0 value disables auto-answer
S2=	Define escape code character, default <+> (43dec.)

11.8. EXTENDED S-REGISTERS "ATSN=X"

The values written on the S-Registers have to be decimal.

Command	bit	dec	hex	Function and Description
S15=	bit	dec	hex	Bit-mapped register
	7-5	0	0	Profile 0 as active settings after power ON
		32	20	Profile 1 as active settings after power ON
		64	40	Profile 2 as active settings after power ON
		96	60	Profile 3 as active settings after power ON
		128	80 *	Factory default as active settings after power ON
S18=		dec		DTE speed selection mode.
		0 *		Disable fixed baud function (Autobaud mode).
		n+1		Enable baud rate fixing at n=0-13 baud rate. Value settings of n are the same as S20 values.
S20=		dec	hex	DTE speed decided by autobaud (bps). Valid only if s18=0.
		0	0	230400 bps (not supported by autobaud, only fixed value) only for netMods with hardware version V01
		1	1	115200 bps
		2	2	57600 bps
		3	3	38400 bps
		4	4	28800 bps
		5	5	19200 bps
		6	6	14400 bps
		7	7	12000 bps
		8	8	9600 bps
		9	9	7200 bps
		10	A	4800 bps
		11	B	2400 bps
		12	C	1200 bps
		13	D	300 bps

S23=	bit	dec	hex	Bit mapped register
	0	0	0	Command echo disabled
		1	1	Command echo enabled
	345	0		Corresponds to ATX0
		8		Corresponds to ATX1
		16		Corresponds to ATX2
		24		Corresponds to ATX3
		32		Corresponds to ATX4
		40		Corresponds to ATX5
		48		Corresponds to ATX6
	6	0	0	Display result code in numeric format
		64	40	Display result code in verbose format
	7	0	0	Modem returns result code
		128	80	Modem does not return result code
S40=	bit	dec	hex	Bit mapped register
	1	2	2	No result code displayed in answer mode
S42=	bit	dec	hex	Bit mapped register
				This register defines the RING answer format. Possible values and the corresponding RING formats are listed below:
		0		RING
		1		RING <Called Party Number>
		2		RING <Calling party number>
		4		RING <bearer Service>
		3 *		RING <called Party Number> ; <Calling Party Number>
S56=		20-100		Hook flash detect time for analogue Adapter (POTS port); units 10ms. This register's contents can give a Hook flash detect time of up 1 second.
S79=	bit	dec	hex	Bit mapped register
	2	0	0	POTS 1 call-waiting disabled
		* 4	4	POTS 1 call-waiting enabled
	3	0	0	POTS 2 call-waiting disabled
		* 8	8	POTS 2 call-waiting enabled
S82=	bit	dec	hex	Bit mapped register
		74	4A	PPP/MLPPP B Channel Protocol.
		76	4C	Voice Transparent B Channel Protocol
		78	4E	PPP Transparent B Channel Protocol
		80	50	Data Transparent B Channel Protocol

S83=	bit	dec	hex	Bit mapped register
	0	* 0	0	POTS 1 delayed clear-back enabled.
		1	1	POTS 1 delayed clear-back disabled.
	1	* 0	0	POTS 2 delayed clear-back enabled.
		2	2	POTS 2 delayed clear-back disabled.
S84=	bit	dec	hex	Bit mapped register
	0	0*	0	Disable POTS 1 Caller ID indication if both B Channels are used for bundle connection (MLPPP). See note.
		1	1	Enables POTS 1 Called ID indication if both B Channels are used for bundle connection(MLPPP).See note
	1	0*	0	Disable POTS 2 Caller ID indication if both B Channels are used for bundle connection (MLPPP). See note.
		2	2	Enable POTS 2 Caller ID indication if both B Channels are used for bundle connection (MLPPP). See note.
	4	0 *	0	Indicates Caller ID.
		16	10	Disable Caller ID indication
				Note: If both B Channels are used for data bundle connection (MLPPP) and there is an incoming voice call netMod must drop one B Channel in order to transmit the FSK sequence. If the user does not want the B Channel to be dropped, must disable this function using bits 0 & 1 of S84.
S85=	bit	dec	hex	Bit mapped register
	0	* 0	0	POTS 1 Calling Line Identification Restriction disabled
		1	1	POTS 1 Calling Line Identification Restriction enabled
	1	* 0	0	POTS 2 Calling Line Identification Restriction disabled
		2	2	POTS 2 Calling Line Identification Restriction enabled
	2	* 0	0	POTS 1 Connected Line Identification Restriction disabled
		4	4	POTS 1 Connected Line Identification Restriction enabled
	3	* 0	0	POTS 2 Connected Line Identification Restriction disabled
		8	8	POTS 2 Connected Line Identification Restriction enabled

S87=	bit	dec	hex	Bit mapped register
				Note: Global calls are those incoming calls that do not contain Called_Party_Number Information Element in the SETUP message.
	0	* 0	0	Enable POTS 1 port to receive global calls (see note).
		1	1	Disable POTS 1 port to receive global calls (see note).
	1	* 0	0	Enable POTS 2 port to receive global calls (see note).
		2	2	Disable POTS 2 port to receive global calls (see note).
	5-6	0 *	0	Bundle connection is disabled
		96	60	Bundle connection is enabled on outgoing calls
S89=	bit	dec	hex	Bit mapped register
	0	0	0	Disable Total and Last call's charging counters of analogue adapter, POTS 1.
		1	1	Enable Total and Last call's charging counters of analogue adapter, POTS 1.
	1	0	0	Disable Total and Last call's charging counters of analogue adapter, POTS 2.
		2	2	Enable Total and Last call's charging counters of analogue adapter, POTS 2.
	2	0	0	Disable Total and Last call's charging counters of data port.
		4	4	Enable Total and Last call's charging counters of data port.
	5	0	0	Disable the metering pulse of analogue adapter, POTS 2.
		32	32	Enable the metering pulse of analogue adapter, POTS 2.
	6	0	0	Disable the metering pulse of analogue adapter, POTS 1.
		64	40	Enable the metering pulse of analogue adapter, POTS 1.
S100=	0			Supplementary Services Protocol
		0*	0*	Functional Protocol is enabled.
		1	1	Keypad Protocol is enabled.
S101=	bit	dec	hex	CID transmission method
	0	0*	0*	CID FSK pattern is transmitted during ringing between the 1st and 2nd ring.
		1	1	CID FSK pattern is transmitted prior to ringing.
S108+n=		dec	hex	High Layer Compatibility n=0, analogue adapter, POTS 2 n=2, ISDN data n=3, analogue adapter, POTS 1
		0 *	0	No High-Layer-Compatibility information element will be sent

S118=	bit	dec	hex	Bit mapped register
	0	0*	0	Enable analogue adapter POTS 1 incoming calls
		1	1	Reject analogue adapter POTS 1 incoming calls
	1	0 *	0	Enable analogue adapter POTS 2 incoming calls
		2	2	Reject analogue adapter POTS 2 incoming calls
S119=	bit	dec	hex	Layer 2 Deactivation
	0	0*	0*	Layer 2 will be deactivated on expire of a 10 seconds timer. This timer starts after the end of the call.
		1	1	Layer 2 will be deactivated only from network side.
S123=		dec	hex	Full Functionality Emergency Mode
		0	0	Disables Full Functionality Emergency Mode
		1-255	1-FF	Enables Full Functionality Emergency Mode Forces POTS ports & the serial port to remain operational if AC power fails. If this mode is selected, it is possible that the power from the U-line is not enough. In this case the user must restore the default value (0).
S124=		0-255	0-FF	Add persist time for BOD in seconds unit
S125=		0-255	0-FF	Sub persist time for BOD in seconds unit
S126=		0-255	0-FF	Add-threshold for BOD in kbps unit
S127=		0-255	0-FF	Sub-threshold for BOD in kbps unit

* Default Values

11.8.1. PERMANENT STORAGE OF S-REGISTERS SETTINGS

The changes of S-Registers settings are stored in netMod's RAM memory. This means that when we restart the system the values in S-Registers are the standard ones that have been programmed from the factory. To make the storage of the settings permanent, the user has to use the "user profiles". The process is described below.

When the desired settings are completed, the user has to give the following commands:

- AT&Wn, where n takes the values 0 to 3, and is the "profile number" that the settings are stored. This command will store the present settings in the wanted "profile". Afterwards, to make this "profile" that we have store the settings an "active profile" after restarting the system, we have to give the command:

- ATS15= the value that corresponds to the "profile" that we stored the desired settings.

The settings which are programmed from the analogue ports via a telephone set change the values in S-Registers. These settings are permanent. For the storage of these settings, "user profile" number 0 is used which also becomes the active profile after system restart (hardware reset).

The key combinations that change the values in S-Registers are:

*43#, #43#, **10#, **11#, *89#, #89#, **71#, **70#, *77#, #77#, *85#, #85#.

12. MECHANICAL PARTS

netMod product is wall- mounted and is enclosed in a fixed cover A, and a removable cover B.

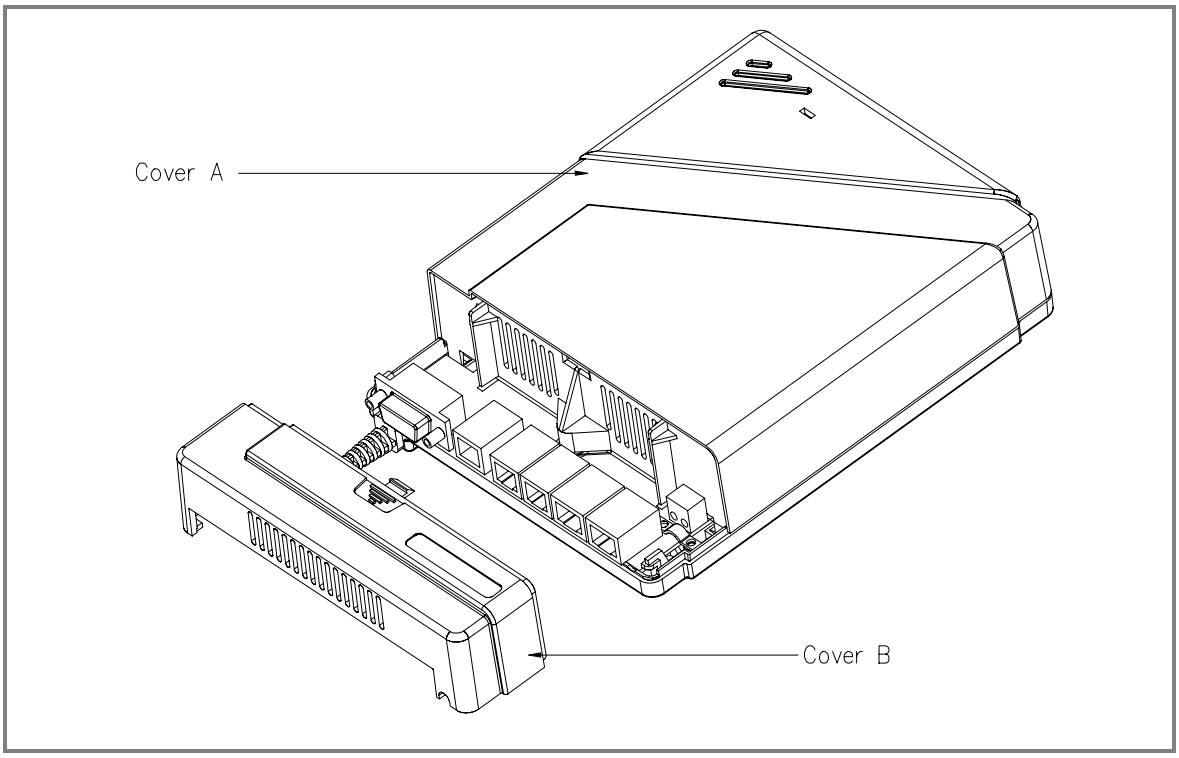


Fig. 12: Covers A and B

By removing cover B the U-line connector is exposed, where the incoming twisted pair U-line is connected (Fig. 13).

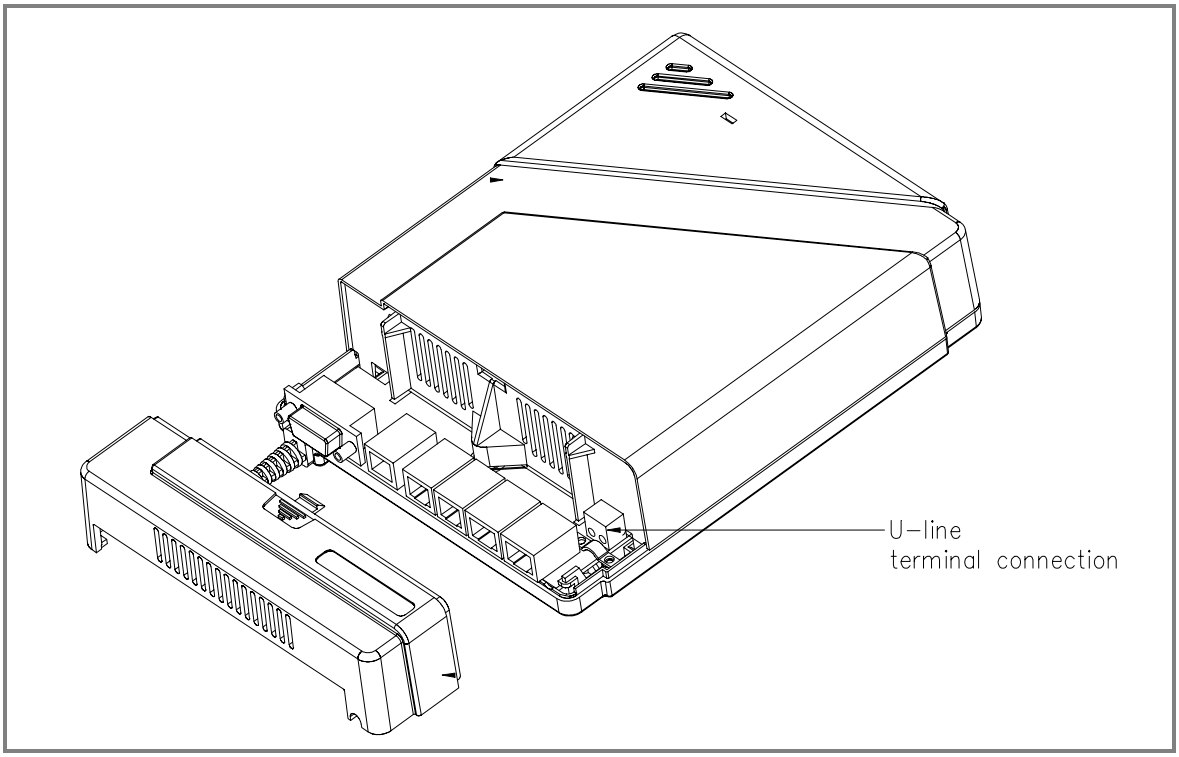


Fig. 13: The U-line terminal connection

The maximum number of connectors appears at the front panel of netMod. The ISDN- type terminals may be connected to the two S-bus connectors, the POTS-type terminal devices to the two POTS connectors and a PC through a D-type 9-pin connector or an optional USB receptacle (Fig. 14).

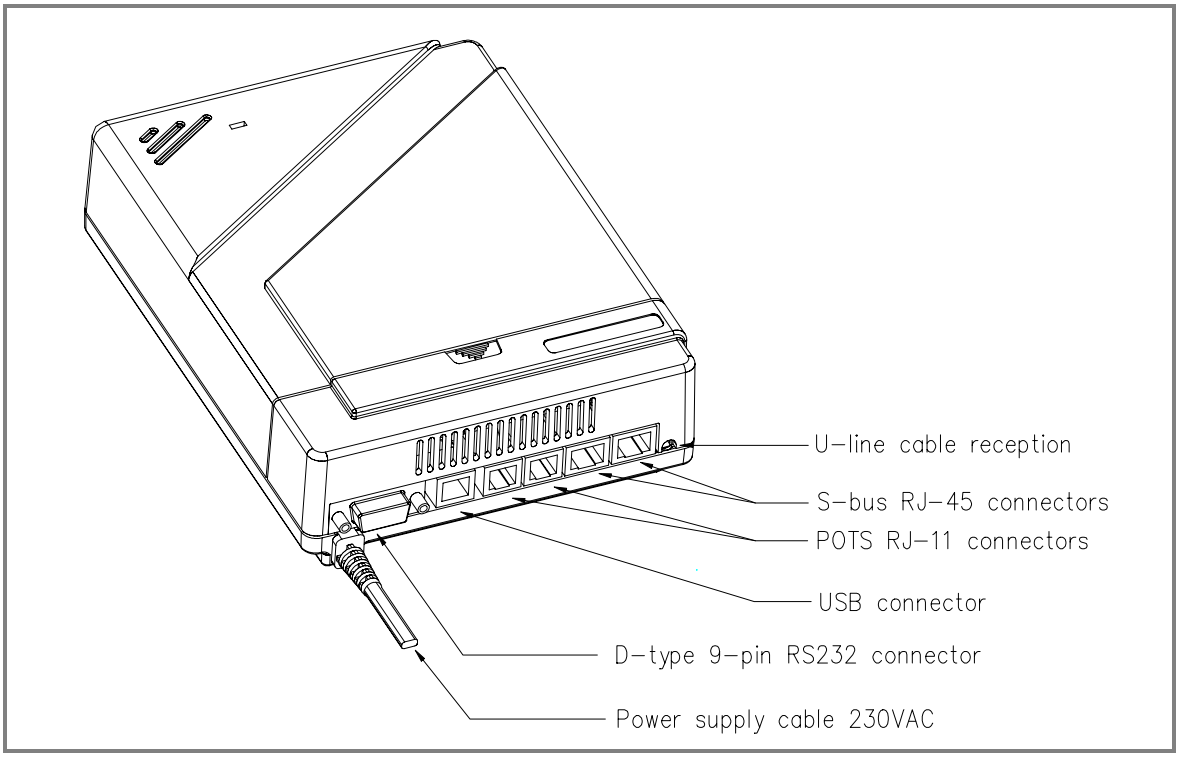


Fig. 14: The U-line, S-bus, POTS, (USB optional) and D-type 9-pin connectors (netMod)

Wall mounting is achieved through the two mounting holes shown in Fig. 15.

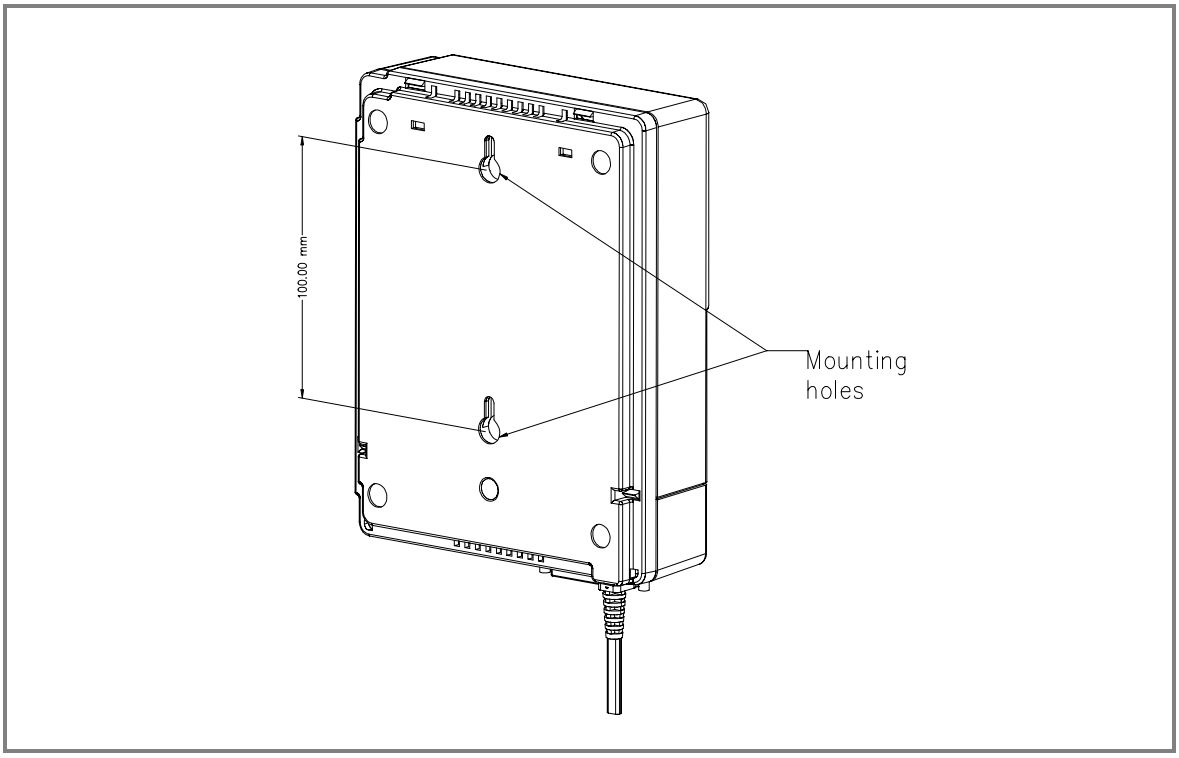


Fig. 15: The 2 mounting points

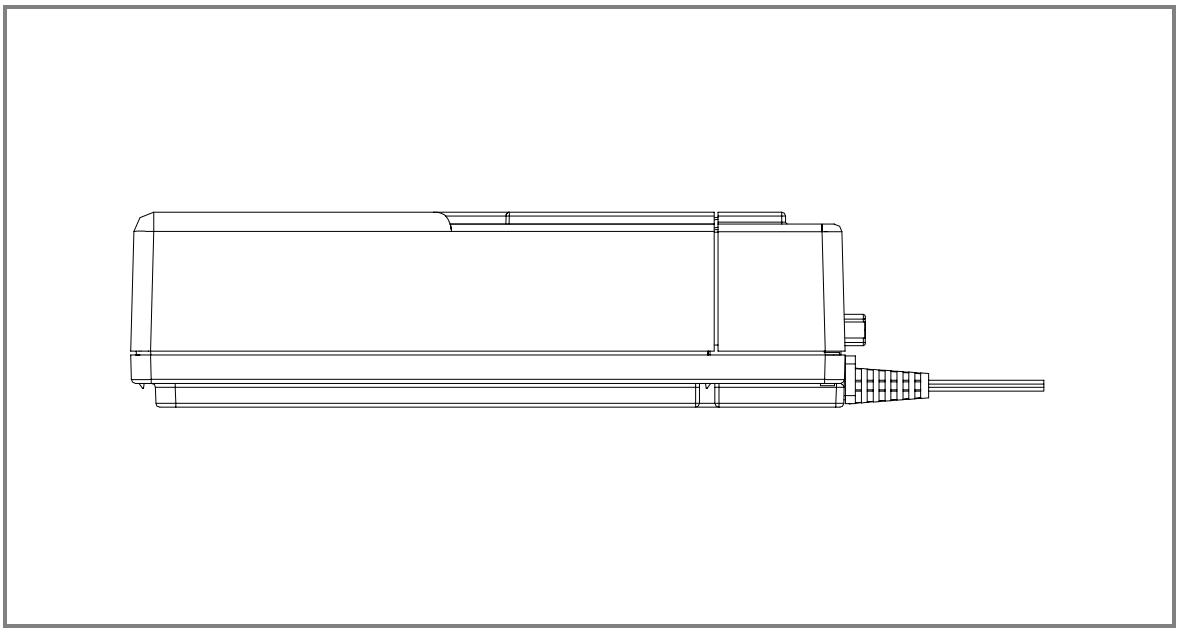


Fig. 16: Side view of the plastic box

13. PINOUT ASSIGNMENTS

13.1. PHONE JACK PINOUT ASSIGNMENTS

13.1.1. RJ-45 CONNECTOR FOR THE S/T INTERFACE

Pin	Description
1	Not Connected
2	Not Connected
3	RCV +
4	XMT +
5	XMT -
6	RCV -
7	Not Connected
8	Not Connected

Table 3: Pin description of the RJ-45 connector

13.1.2. RJ-11 ANALOG CONNECTOR (TWO ANALOG PORTS)

Pin	Description
1	Not Connected
2	Ring
3	Tip
4	Not Connected

Table 4: Pin description of the RJ-11 connector

13.2. SERIAL PORT INTERFACE

13.2.1. ASYNCHRONOUS H/W FLOW CONTROL CABLE CONNECTION

Modem (DCE) DB9	Signal	to PC (DTE) DB9
3	**TXD**	3
2	**RXD**	2
7	**RTS**	7
8	**CTS**	8
6	**DSR**	6
5	**Ground**	5
1	**CD (DCD)**	1
4	**DTR**	4
9	**RI**	9

Table 5: Asynchronous H/W flow control cable connection

14. INSTALLATION GUIDELINES

Always observe standard safety precautions during installation of this product. To avoid the possibility of electrical shock, be sure to disconnect the power supply cord from the power source before you remove the device case.

The installation procedures described hereafter must be performed by qualified personnel aware of the hazards involved. The personnel involved in equipment installation must be trained in the installation of this device and must strictly observe all the safety precautions related to the installation of communication equipment.

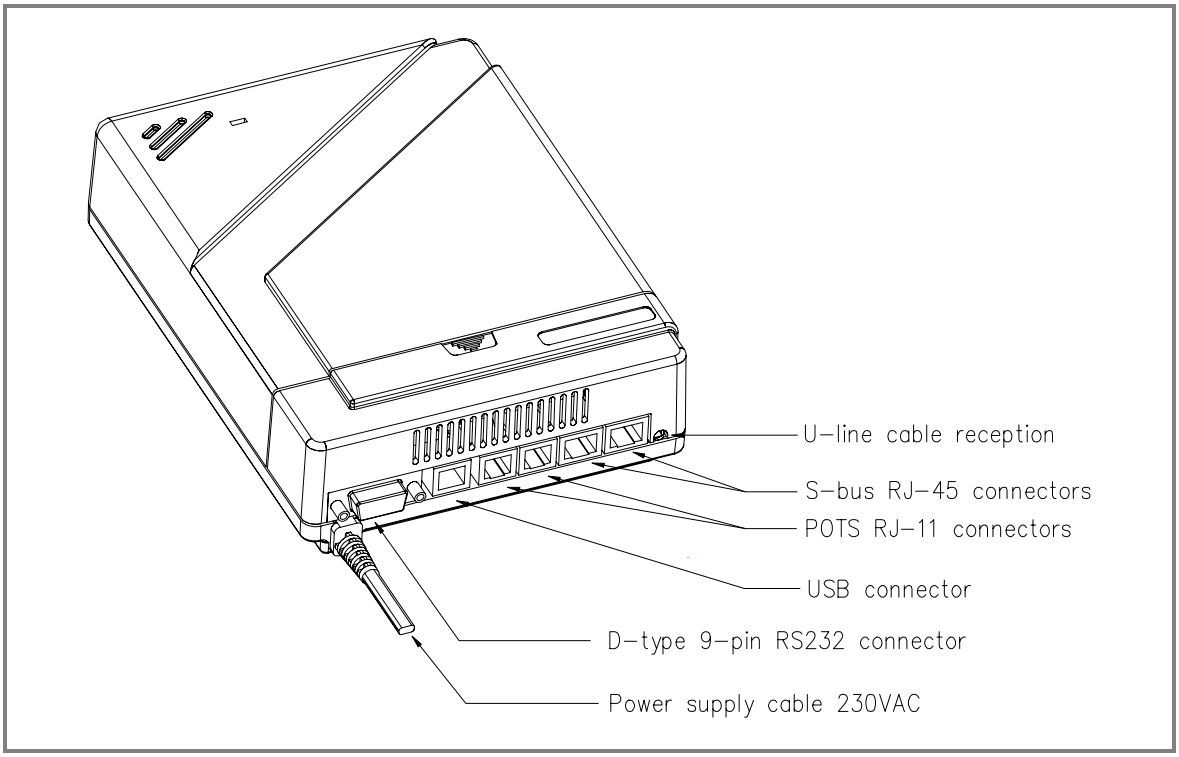


Fig. 17: The netMod

The following connectors appear on the front panel of the netMod:

- D-Type 9 pin connector: Serial Port DB9 female connector for connection to the serial port of a DTE (computer/terminal)
- USB connector (OPTIONAL)
- POTS RJ-11 connectors: terminal jacks for connecting to analogue equipment

- S-bus RJ-45: for the S-interface
- U-line cable reception: RJ-11 jack, or two-contact screw-type terminal block for U-interface
- Power Supply cable: for AC mains power connection

Three steps are required for the installation of netMod:

- connect the two wire U-line to the screw type terminal blocks, or RJ-11 jack
- plug the power supply cord to an AC wall jack
- observe the green LED status on the top side of netMod: the power LED should lit.

The ISDN and POTS terminals can now be connected and operated.

In order to connect netMod to his/her PC, the user needs to complete the following steps:

- turn off the power to the PC
- connect the male end of the 9-pin cable to the serial port
- connect the female end of the 9-pin cable to the computer's serial port.
- turn the PC on.

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